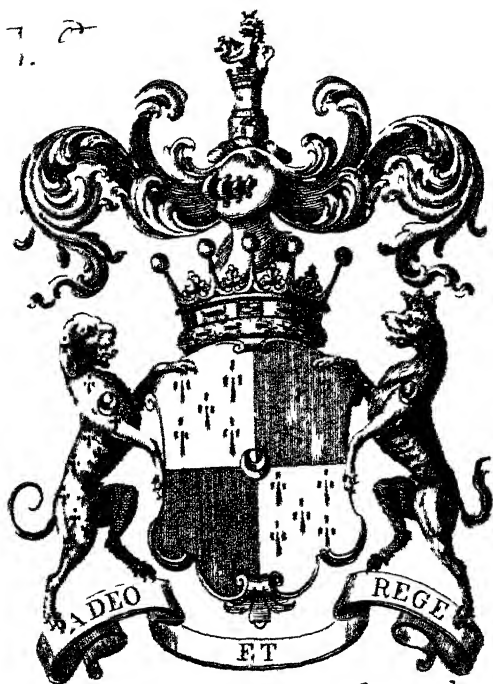


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Philip Earl Stanhope.



AGRICULTURAL RESEARCH INSTITUTE

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PHILOSOPHICAL
TRANSACTIONS,

GIVING SOME

ACCOUNT

OF THE

Present Undertakings, Studies, *and* Labours,

OF THE

INGENIOUS,

IN MANY

Confiderable Parts of the WORLD.

VOL. XLIX. PART II. For the Year 1756.

L O N D O N.

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PHILOSOPHICAL TRANSACTIONS.

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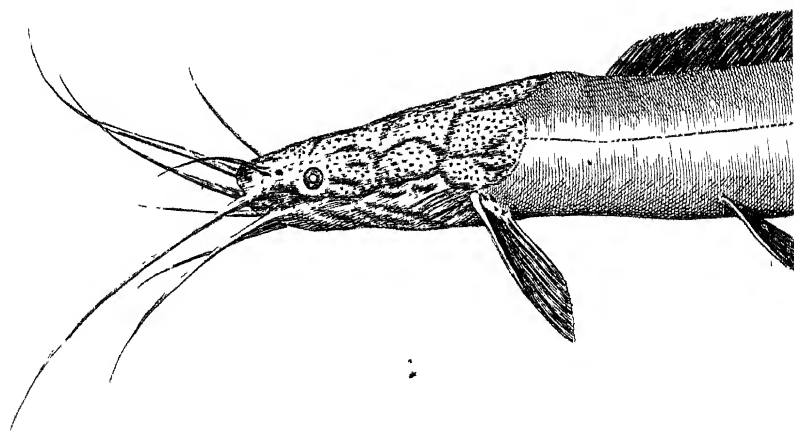
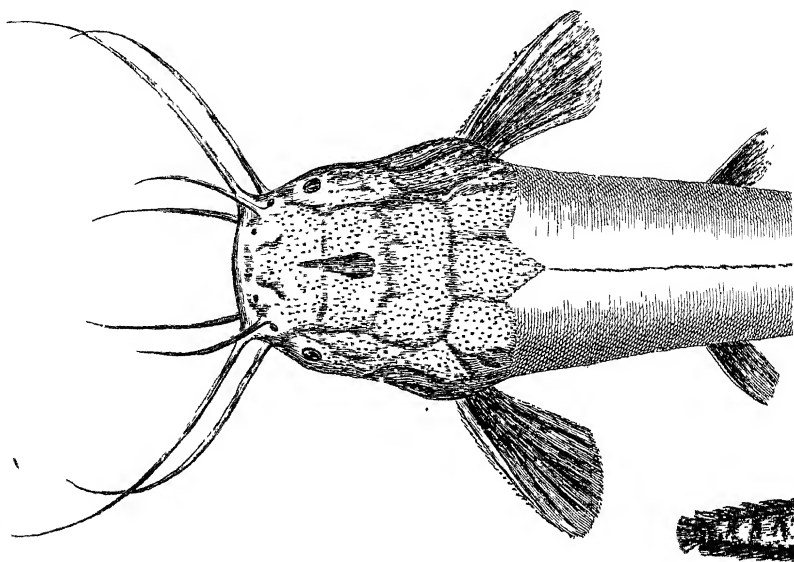
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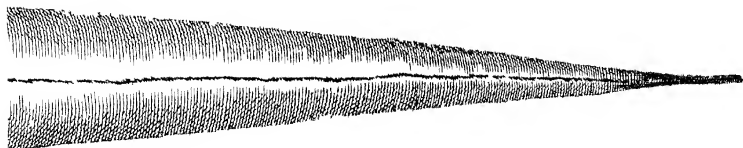
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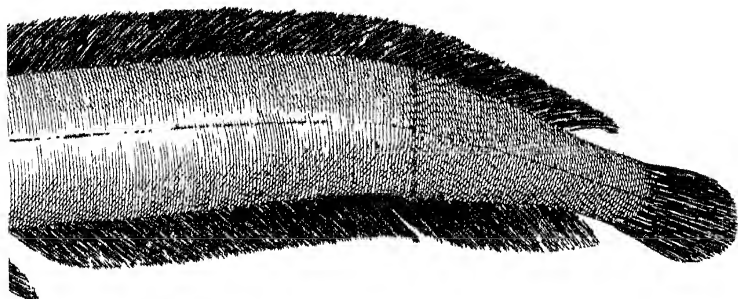
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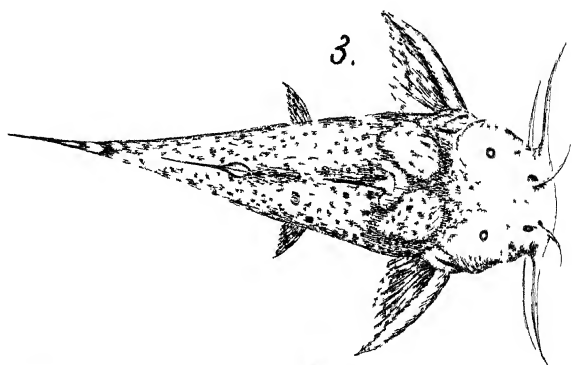
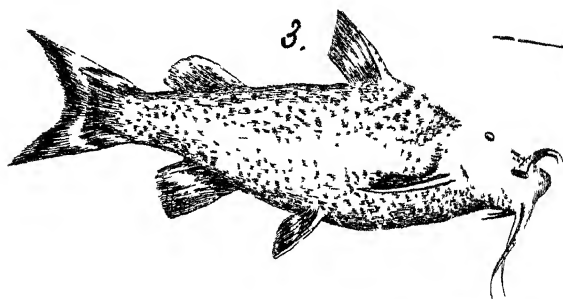
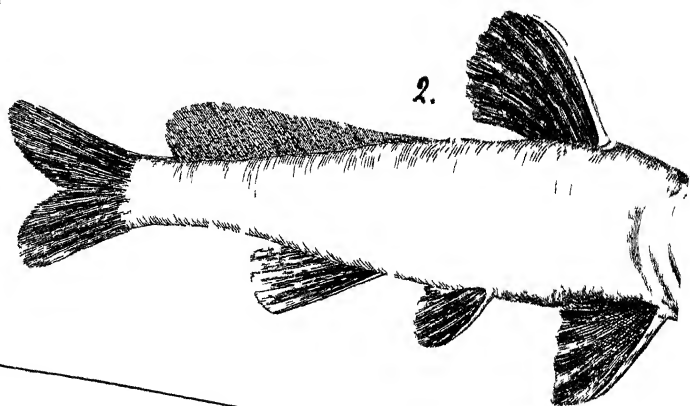


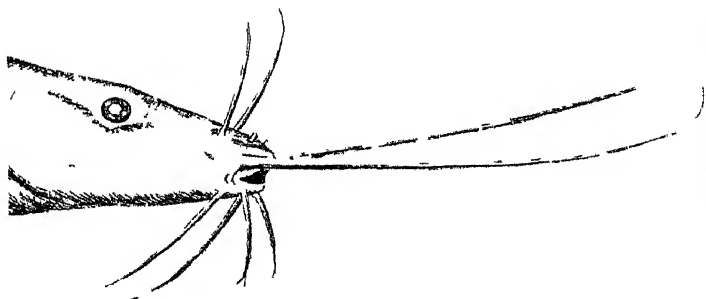
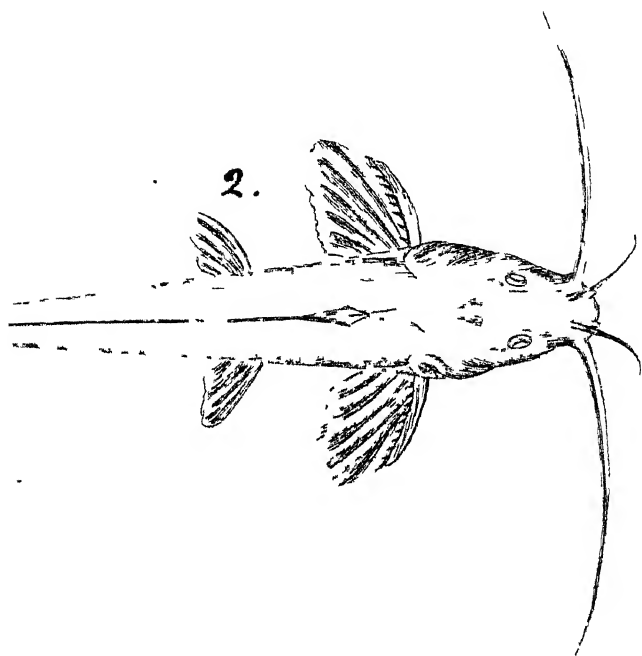
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LX. *An Account of Four undescribed Fishes of Aleppo ; in a Letter to Mr. Peter Col-
linson, F.R.S. by Alexander Ruffel, M.D.*

S I R,

Read Jan. 15, 1755. **H**AVING at Aleppo met with a few fishes, which appeared to me singular, I was induced to bring with me drawings and descriptions of them ; which I have since shewn to several curious gentlemen, abroad as well as in *England*, to all of whom I found they were likewise unknown.

Fig. 1 and 4 (TAB. XII.) seem to be quite new *genera* ; and 2 and 3, (*TAB. XIII.*) tho' they belong to the same *genus* with the *Mystus*, described by *Gronovius* in his *Mus. Ichthyologic*, p. 34. No. 83, and p. 35, No. 84 ; yet are species of that fish, that I cannot find have hitherto been described. I therefore imagined, that the laying them before the Royal Society would not be disagreeable ; and as you were so kind as to offer me your assistance on this occasion, I have sent you the drawings and descriptions inclosed. I am,

S I R,

Lime-street, 9 Dec.
1755.

Your most obedient

humble servant,

Alex. Ruffel.

THE fish *Fig. 1*, in its shape a good deal resembles the *Silurus Rondeletii*; like it too having no scales. Its length (from the nose to the tip of the tail) 20 inches; weight 20 ounces; but they are of different sizes. The head and back are of a black colour. The lateral line runs quite from the head to the tail, on the middle of the side; below which, to the belly, the colour gradually changes into a dark purple: of the same colour is the under part of the head. The head is flat, and in length near five inches. The body roundish, till within a few inches of the tail, where it grows flat. The mouth is not so large in proportion as that of the *Silurus*; it has no tongue, and the structure of the mouth and palate agree exactly with the description of that fish. From the edge of the nostril on each side arises a small *cirrus*; and from the angles of the mouth two others, that are stronger, and twice as long. On the lower lip are four more, the two external being the longest. The eyes are situated near the corner of the mouth, close upon the inferior edge of the upper jaw. The *branchiæ* are four on each side, and all of them have a double row of sharp points, like the teeth of a comb. It has two fins, situated near to the *branchiæ*, consisting of seven *radii*, to the interior part of which is joined a pretty strong prickly bone: about an inch above the *anus* are two smaller fins. A long fin extends from a little way under the *anus* to the tail, as another of the same kind does from the neck all along the back: neither of these fins join with the tail, which is round at the tip, and composed of about twenty-two feathers.

This

This fish is found in the river Orontes, and I believe also in some stagnant waters near to it. The markets of Aleppo are plentifully supplied with it, from the month of November till the beginning of March. The flesh is red like beef, and of a rank taste; and tho', for want of better, eat much by the people, yet is esteemed unwholesome. The name it usually goes by is *Semack al Afwad*, which signifies the Black Fish. Its proper name however, among the natives, is *Siloor*.

The fish *Fig. 2*, is about four inches long. The head is large and flat, the body oblong and compressed. Its colour is mostly of a dark silver. The eyes are large and protuberant. From the lower jaw arise four *cirri*; the longer measure one inch, the shorter two thirds of an inch. From the upper jaw arise two longer, each measuring two inches and a half, of a firmer texture than either those of the lower jaw, or two other small ones placed just by the nostrils. Between the two long *cirri* are two small *tubuli*. The whole of the *cirri* are of a white colour, excepting the two longest, which are of a darkish colour, like the upper part of the head. The fins are eight in number. Two by the gills, each furnished with a strong saw-like bone. Two small ones near the *anus*. One of eight *radii*, situated half-way between the *anus* and the tail. One consisting of seven *radii* on the back. Another fin, of a membranous and fleshy texture, arises from the middle of the back, and is continued all along to the tail. The tail is forked.

This fish is found in the river Coic at Aleppo, where the fish in general are extremely small, in

proportion to those of the same kinds found in other rivers, probably owing to the assiduity of the fishermen. It is called by the natives, *Zakzuk*.

Fig. 3. represents a fish, which in its general form somewhat resembles the above. It is in length three inches. The head is rather flatter; the mouth has a more inferior situation, and is in proportion larger than that of the former fish; the eyes much smaller. The *cirri*, situated as in the other, are eight in number, but much shorter those that rise from the upper jaw (being the longest) measuring only one inch; they are also flatter at their origin.

They both agree in the number of their fins; neither has the saw-like bone in the fin of the back, but only in those near the gills. The fleshy fin of the back is much smaller than in the *Zakzuk*, and rises at a much greater distance from the back fin. The colour is a pale silver marbled with grey; particularly the lower part of the fins and tail. The two larger *cirri* likewise marbled, the others white.

These two fishes (*Fig. 2, 3.*) have no scales, and the palate and other structure of the inside of the mouth is like that of the *Silurus*.

This last described fish is also from the river Coic.

The fish *Fig. 4.* has upon a slight view so much the appearance of an eel, and, except its not being so fat, eats so like that fish, that tho' it is much oftener brought to the tables of the Europeans at Aleppo than any other fish found in the river Coic, it has never been suspected of being any-ways different from the common eel; and yet, upon examination, it will be found of quite another *genus*.

The

The head is long and small. The extremity of the upper jaw runs out to a narrow point like the bill of a bird ; on each side of which, a little distant from the extreme point, are two *tubuli*, or processes. As in the common eel, there are two fins at the gills. From the occiput all along the ridge of the back, small prickles are placed at little distances, resembling the teeth of a saw ; these terminate at the origin of a membranous fin, rising about four inches from the tail, and is continued (as in the eel) along the lower part of the belly to the anus, at which place are also found two or three prickles. The colour of the head and back is blackish, variegated with dark-yellow spots. The lower belly white, changing gradually into a yellowish cast. The fin of the lower belly near to the anus is yellow, the other half spotted with black. The length of the fish described was eleven inches.

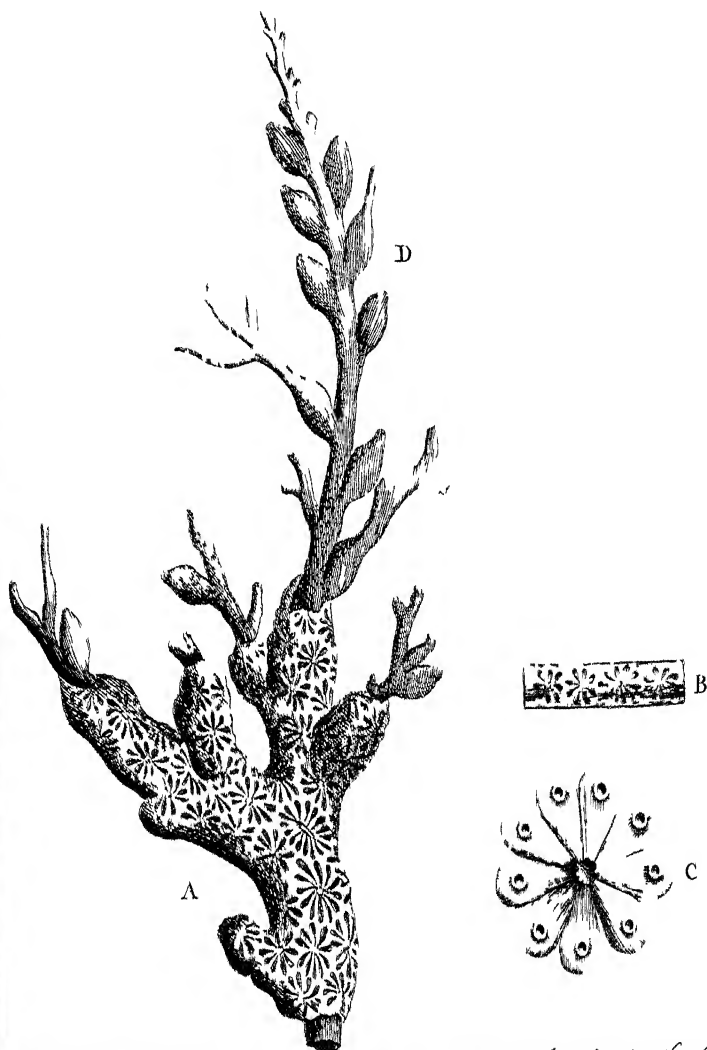
LXI. *An Account of a curious, fleshy, coral-like Substance ; in a Letter to Mr. Peter Collinson, F. R. S. from Dr. John Albert Schloffer, M. D. F. R. S. with some Observations on it communicated to Mr. Collinson by Mr. John Ellis, F. R. S.*

Dear Sir,

Read Jan. 22, 1756. **I** Hir'd some fishermen to drudge for me in this harbour, in order to examine the small English coral, or *corallium nostras* of Ray's *Synopsis*, recent in the microscope. The first

first time they hauled in the drudge, I discovered a most extraordinary sea-production furrounding the stem of an old *fucus teres*: it was of a hardish, but fleshy substance, and more than an inch thick, of a light brown or ash colour, the whole surface covered over with bright yellow shining and star-like bodies, which induced me to believe it to be an undescribed species of alcyonium. I put it immediately into a bucket of sea-water, expecting every moment, that the polypes, which I thought to lodge in those little stars, would extend and shew themselves like those of the alcyonium, N^o 2 of *Ray's Synopsis*, commonly called dead-man's hand; but after more than half an hour's fix'd attention, the vessel lying very quiet all the time, I did not perceive the least appearance of any polypes: upon which I brought them to shore in the sea-water, and then, by means of my microscope, I discovered every one of those stars to be a true animal, and much more beautiful than any polype, but quite of a different structure; which I shall now describe to you.

Every one of those stars is composed of many thin hollow radii, of a pear-shape form, from five to twelve or more in number, all united intimately at their smaller end: every radius appears broad at the extreme part from the center, and a little convex in the middle of this raised broad part. When the animal is alive, there appears a circular little hole, which contracts and opens itself frequently. All the radii are of this structure; but their common center, which is formed by a combination of all the small converging extremities, exhibits an opening of a circular, oval, or oblong figure, forming a kind of rising rim like



*Fleshy Alcyonium full of Stars with blunt Rays surrounding a Focus found in the Sea
near the Lizard Point*

Brooking delin

J. Wynde sc

like a cup, which, when the animal is alive and at rest, contracts and expands itself to many different degrees, with great alertness and velocity, though sometimes it remains a great while expanded, or contracted. In all these holes, the central large one, as well as the smaller ones (which last I take to be the mouths of the animal) I could not perceive any tentacula, or claws, on the outside; but by looking into them very narrowly, I saw something like very tender little fibres moving at the bottom of their insides.

By comparing and examining all the various pieces I had collected of this fleshy substance, with its shining stars, I observed, that the size and colour, as well as the very figure of these stars, varied greatly, but the structure of the leaf-like radii, and that of their mouths, and their motions, were perfectly the same, in every one individual.

Many of these bodies I have found so thick and large as to resemble the great branch'd Madrepora coral, especially as they are generally to be met with covering and inclosing the stem and branches of this stiffer, ramose fucus.——Thus far D. Schloffer.

Fig. A (TAB. XIII.) expresses this alcyonium in its natural size, surrounding the stem and branches of a fucus. I have called it, *alcyonium carnosum asteriscis, radiis obtusis, ornatum*.

Fig. B, part of a leaf of the common alga, or sea-grass, with 4 of these starry figures on it.

Fig. C, one of the stars magnified.

Fig. D, represents the fucus, on which it grows, which I cannot find any-where described. I have intitled it, in my collection of English fucus's, by the following descriptive name, *Fucus teres frutescens*.

tescens, germinibus arborum gemmas fructiferas referentibus.

I have had an opportunity lately of examining this curious, fleshy, coral-like figure in the microscope, and find, that all the interfices between the stars are fill'd with eggs of different sizes, each adhering by one end to a very fine capillary filament. The smallest eggs are globular, and as they advance in size, change to an oval figure; from thence they assume the shape of one of the radii of the stars.

In several of these stars I have observed a smaller radius, as it were, endeavouring to get into the circle; and notwithstanding their seeming connection in the center as one animal, I believe I shall soon be able to shew you, in a drawing from the microscope, that each radius is a distinct animal by itself. I am,

Dear Sir,

Lawrence-lane, Jan. 22,
1756.

Your most affectionate Friend,

John Ellis.

LXII. Two singular Cases of diseased Knee-joints successfully treated. The first by topical Applications; the second by Operation. By Mr. Joseph Warner, F. R. S. Surgeon to Guy's-Hospital.

Read Jan. 22,
1756.

D Seases of the larger joints of the extremities have always been look'd upon by surgeons of the greatest eminence in their pro-

profession, to be attended with considerable danger to the patient; and with the greatest reason; since they have been convinced from much experience, that these maladies are too often the consequences of depraved habits of body, arising from scrophulous, scorbutic, or some other general cause. But tho' we are sufficiently apprized of these facts, and that they too often baffle the greatest skill in physic and surgery, we are nevertheless not to infer from hence, that every disorder of this kind is attended with the like bad circumstances; since it is well enough known to the experienced, that diseases of the joints, particularly those of the knee, are sometimes merely local complaints, which may not only be assisted by surgery, but perfectly cured. These species of tumors I now hint at, are those, which are distinguished by the name of *hydrops articuli*, or the dropsy of the joint; of which there are, as I have often observed, two different kinds. The one, wherein the disease is situated in the *membrana adiposa*, and neighbouring parts on this side the capsular ligament. The other is that species of disease, wherein the fluid is contained within the capsular ligament, betwixt the extremities of the thigh-bone, and the largest bone of the leg. The first species of tumor may be distinguished from the second by the touch; from the appearance of the tumor of the first kind, which is pale and uniform; from a want of fluctuation; and from the little or no degree of pain attending it. The repeated use, for some weeks, of emollient fomentations, mercurial frictions, and gentle purges, has been often known to remove this disorder. At other times it has been found, that

these applications have had little or no effect, but that the disease has given way to, and been totally removed by the use of perpetual blisters to the part affected; which should, in most instances, be continued for several weeks. At other times, I have known the Piffeleon Indicum, in English called the Barbadoes tar, to have so good an effect, by being applied every day to the joint, for some weeks, even after every other remedy had failed, as to cure such a disorder of the knee-joint, as had hitherto been judged desperate: in which case there plainly appeared to be an enlargement of the bones, as well as a very considerable one of the integuments, and of the tendinous and ligamentous parts, but without any apparent inflammation. In this instance there was no extravasated fluid could be discover'd; however, there was an immobility of the joint, and a considerable contraction of the hamstrings. The pain was extravagantly great, which the patient described as shooting thro' the ligaments of the joint, the kneepan, the extremities of the thigh-bone, and those of the leg. He had a severe symptomatic fever, which had been of many weeks continuance, and was become greatly emaciated thereby. The reason for my giving so particular a relation of the circumstances attending this fact proceeds from my desire of recommending a trial of the same remedy, in the like cases; which, as far as I can judge from my own experience, may always be safely done, where there is no degree of inflammation already formed upon the integuments. And I am farther induced to communicate a short history of the case to this Society, as it is an application I never saw made use of before, in the
like

like case, tho' the use of it has not been uncommon in old sprains of the joints; wherein it has oftentimes been found to be of singular service, even when other remedies have been ineffectually tried.

The second species of *hydrops articuli*, or that wherein the extravasated fluid is contained within the capsular ligament, may be distinguished from the first, from its deep situation; from the fluctuation, which is felt upon patting the knee on one side, while the other hand is held immoveably on the opposite side; from the degree of pain arising from the distension, which the capsular ligament suffers, in consequence of its contents; from the incapacity of bending the joint; and from the circumstance of its being attended with no general complaints of body, as well as from the sudden enlargement of the tumor; upon the increase of which depends the degree of uneasiness in the part. This is very far from being the case, in that kind of disease called the *spina ventosa*, which arises originally from the medulla and bone itself being diseased; from whence proceed grievous pricking and throbbing pains, that come on previously, in general, to any visible enlargement of the part affected, or any discoverable quantity of fluid deposited in the joint; the difference of which symptoms resulting from the different diseases may be learned from the succeeding case, wherein it was judged necessary to cut more than once thro' the capsular ligament, in order to evacuate its contain'd, extravasated fluid; which, contrary to the common received opinion of wounds of the ligaments being attended with certain destruction to the limb, should always be done under the like bad circumstances, in reasonable expectation

of removing a complaint, which totally disables the patient, and too frequently terminates in the loss of the limb, when neglected. And I am more particularly inclined to recommend this practice, as I am convinced, that this disease is out of the reach of such applications, as are of service in other diseases of these parts, whose situation is more superficial; that is, on this side the ligament, in which is contained the synovia.

William Drury, aged 28, by business a porter, was put under my care, on the 5th of September, 1754, for a disorder in his knee. Upon enquiry, it appeared greatly swelled, was attended with excessive pain, which was continual: there was not the least degree of inflammation upon the integuments; the patient was incapable of bending his knee in the least degree, or of setting his foot to the ground. He could get no rest. The disorder arose without any accountable cause, and had been only of three weeks standing. Upon placing one hand on the outside of the knee, and by patting with the other on the inside, it was easy to discover a fluctuation; on which account I judged it advisable to make an opening into the tumor, which I did by incision on the upper and inside of the knee-pan, as this was the most prominent part; upon which, a thick, gelatinous fluid, deeply tinged with blood, was discharged in a full stream to the quantity of fourteen ounces. After the whole of it was evacuated, I passed a probe thro' the wound, which went under the knee-pan: the wound was superficially dressed with lint, and the whole of the knee was covered with a pultice of strong beer-grounds and oatmeal. The patient complain'd
of

of considerable pain for about four hours afterwards, when he grew easy, and so continued till the second day after the operation, when the knee became a good deal painful: there was no discharge from the wound. Upon enquiry I found he had not been at stool for three days, which occasioned the administering of a clyster, by which stools were procured, and the pain became considerably abated. On the third day from the operation there appeared a considerable discharge, and his knee was quite easy, which continued so till the sixth day, when the discharge was much abated. The pain returned and continued till the eighth day, when the discharge returned again, and the pain was removed. Observing from this time, that the discharge encreased, and so continued easy till the eleventh day, which proceeded altogether from within the joint, I dilated the wound, that the matter might have a more ready issue. This answered my expectation, and the patient continued easy till the fifteenth day, when he complained of a return of pain. Upon examination, I perceived the outside of the knee was swelled, and upon pressure I discovered a fluctuation; which induced me to make an incision thro' the integuments and capsular ligament, on this side; which, I discovered, by the use of the probe, that passed under the knee-pan, to have a communication with the wound on the inside. From this time the patient went on very well, without any farther complaints; and in about twelve weeks from the first operation, he became perfectly well, and still continues so, without any other complaint than that of a small degree

degree of stiffness in the joint, as I have very lately had an opportunity of informing myself.

During the whole time of the cure, I made use of emollient fomentations, dressed the wounds superficially, and continued the pultice of strong-beer grounds and oatmeal, which were the only methods taken in surgery for his relief.

Hatton-Garden,
Jan. 31, 1755.

LXIII. *Extract of a Letter from Mr. William Pye, dated Manilla, Oct. 1st, 1754, to his Brother in London. Communicated to Mr. Benj. Wilson, F. R. S. by the Hon. Mr. Barrington.*

Read Jan. 29, 1756. **I** Will now give you some description of this place. Manilla is one of the largest of the Philippine islands, and the city is much larger than Oxford, and has two universities in it, and is inhabited only by Spaniards. The houses are large, and built very strong; the ground-floor is stone; the walls of a prodigious thickness; all above is wood, and so contrived, that every piece of timber has a connection with each other, all over the house: they are let into one another, and joined together, that the earthquakes, which are very terrible and frequent, may not throw them down. The convents are likewise very strong and handsome. The suburbs are very extensive, and well inhabited.

In

In the year 1750 they had an earthquake here, which lasted for three months, with almost continual tremblings, which at last broke out in an eruption, in a small island in the middle of a large lake, all round which, the bottom is unfathomable. The third day after the commencing of the eruption, there arose four more small islands in the lake, all burning; and about a mile distance from one there is a continual fire, which comes out of the water, where there is no ground, for upwards of an hundred fathoms deep. This I saw myself, and went very near it. I will get a draught of it and send it you. This happened but four years ago, and if you were to feel some of these shocks, you would think they were capable of producing any thing, for they are very terrible indeed.

LXIV. *An Essay on the Waters of the Holy Well at Malvern, Worcestershire. By J. Wall, M. D. Communicated by the Rev. Charles Lyttleton, L. L. D. Dean of Exeter.*

Reverend Sir,

Read Feb. 5, 1756. **A**S you are pleased to desire some account of my observations on the Malvern-Waters, I have here transmitted them. That I did not do this sooner, you will, I hope, impute to the true cause, the multiplicity of my avocations. I would gladly have repeated the experiments,

ments, and added some more ; but my want of leisure and the badness of the weather prevented me. I am very sensible of the imperfection of this essay, and that it does not deserve the attention of that learned body, to which you are desirous to communicate it ; but as it may perhaps excite some more able hand to pursue the same subject, or induce some benevolent minds to make a well of such virtues more extensively useful, by adding some proper accommodations to it, I do not hesitate to offer it to you, crude as it is.

An Account of some Experiments made upon Malvern-Water, at the Spring-head, Sept. 15, 1743, being a warm, clear Day, in a dry Season.

1. At the spring-head it is extremely cold.
2. It leaves a peculiar pertness, or acrimony in the throat, after it is swallowed, when drank immediately from the spring ; but grows remarkably softer upon keeping, more especially if the place be not very cool.
3. Upon pouring it, when fresh taken from the spring, into a large deep vessel, a great number of very small air-bubbles arose from the bottom, and continued to do so for a great while together.
4. Some powder'd loaf sugar being put into a glass of the water caused at first no alteration ; but when the sugar began to dissolve, an extraordinary number of air-bubbles arose incessantly, and continued to do so for a very considerable time.
5. Being mixt with volatile spirit of sal ammoniac, it acquir'd a very dilute, bluish tincture, but remain'd equally transparent as at first, without the least

least milkiness. This blue tinct was so very dilute, that it was barely perceptible.

6. Oil of tartar per deliquium being dropt in it, no alteration in colour or transparency ensued; nor was there any precipitation, or ebullition.

7. Rhenish-wine and weak spirit of vitriol produced no ebullition or conflict.

8. With galls it grew turbid, but acquired no purplish cast.

9. Solution of silver being mixt with the water did not at first alter its colour or transparency, but by degrees the water grew a little milky; and, by standing some time, became muddy; and then of a dirty reddish purple, and at last, a powder of a deep purple colour was precipitated to the bottom of the glafs.

10. A tincture of logwood, made in distilled water, was not alter'd in colour; only the tinct was diluted in proportion to the quantity of water mixt with it.

11. In like manner it alter'd not, but only diluted, the colour of fyrup of violets.

12. It bears soap extremely well.

13. This water being carried to Worcester, which is about eight miles distant from the spring, in clean bottles close stopt, was weighed very accurately in a large vessel with a very slender neck, by a nice balance, which would bear 14 lb in each scale, and yet turn with a single grain; when it was found, that this vessel filled with

Malvern-water weighed 3 51 3 2 3 2 gr. 6

Bristol-water 3 51 3 6 gr. 4

Rectified spirit of wine 3 41 3 6 3 2 gr. 6,

14. Three quarts, wine-measure, being slowly evaporated in a silver vessel, left not any fæces, or powder that could be collected, but only tinged the bottom of the vessel of a pale yellow colour, as if it had been slightly gilded.

15. Some of this water having been sent up to the very learned and ingenious Dr. Hales (whose genius for experiments of this kind, and veracity in relating them, are above all encomium) was by him examined. The following is an extract of his letter to the rev. Mr. Clare of Madresfield, on this subject.

Teddington, near Hampton-court, Oct, 25, 1750.

S I R,

“ I Have examined the Malvern-water by evapo-
 “ rating a pound averdupoize of it to a dryness,
 “ in a Florence flask, cut with a red hot iron ring to
 “ a mouth of about three inches diameter, as I have
 “ in the same manner examined many other purg-
 “ ing, steel, rain and common waters; and find, as
 “ you told me, that it is a very pure water, with less
 “ than a grain of sediment, ash-coloured, which does
 “ not liquefy by standing, as the sediment of most
 “ waters does: a sign, that it has no salt in it. But
 “ it was very observable, that when it was almost
 “ evaporated to a dryness, there arose invisible pun-
 “ gent vapours, which smelt much like the vapour
 “ of burning brimstone; which was observ’d, not
 “ only by myself, but by others, who came into my
 “ parlour. This pungency was very strong, when
 “ my nose was near the flask, which was set in a
 “ pipkin surrounded with sand. We may reasonably
 “ conclude,

“ conclude, that the finctive virtue of this water is
 “ in this subtle volatile sulphur.

It appears from these experiments, that this water is remarkably pure, light, free from earth and salt of any kind [5, 6, 7, 9, 10, 11, 13, 14.] That it contains some mineral spirit, or at least a volatile elastick fluid [2, 3, 4.] That there is some reason to suspect that it is slightly impregnated with copper [5]; a solution of which may probably be effected by the sulphureous gas observed by Dr. Hales [15]; and that it contains something bituminous [14].

So pure a water may naturally be supposed to keep well, and yet it is not always found to do so, being in some seasons apt to get sourish, and to be full of viscid films, even when all imaginable care has been taken in regard to the bottles, &c. so that there are certainly some substances concealed in the water, which our experiments have not as yet discovered.

This water has been long famed in the country for many extraordinary cures perform'd by it; but being situated in a place, where there is at present no accommodation for strangers, its use has not been so extensive as otherwise it might have been. I find it mentioned in Bannister's breviary of the eyes, printed A. D. 1622, in these lines.

A little more I'll of their curing tell,
 How they help sore eyes with a new found well.
 Great speech of Malvern-hills was late reported,
 Unto which spring people in troops resorted.

'There are two springs, both of which rise very high up the hill, facing the East; the uppermost,

which is about a hundred yards higher upon the hill, is chiefly applied to the eyes; and the other used internally, in several scorbutic and other disorders; or externally to tumors and sores. This distinction is taken notice of by almost every writer, who has treated on the geography or natural history of this county; and yet there does not, from any experiment, appear to be any real difference between them.

The springs are not encreased or diminished very sensibly, either by rains, or drought; and yet the water certainly receives some alteration from the variety of the weather; because it has been observed by those, who have washed their sores at the spring, that the water does not so well agree with them after heavy rains, or fierce showers, as in clear settled weather; which probably is owing to the admixture of some extraneous substance with the water. This also may be the reason, why, in some later experiments, the water has appeared to contain more earth than it did in those I formerly made, when the season was much drier than it has been for some years last past.

The water, upon its first use, purges most persons, and that pretty briskly, if the quantity they drink be considerable; some it vomits, but without much sickness; but it is diuretic in all. It has been long used, both externally and internally, with very great success, particularly in old foul ulcers, disorders of the eyes, scrophula's, leprosies and other diseases of the skin. Many wonderful cures I have been myself witness to in each of these cases.

Mr. G—— S——, a mercer of this town, when he was young, had a scrophulous ulcer in the elbow; which

which had much enlarged the joint and fouled the bone. He had been long attended by two surgeons of eminence, who had at last proposed amputation, as the only probable means of cure. His parents not being willing to submit to this, sent him to Malvern, and by the use of this water, for a few months he was perfectly cured, and the limb has remained well ever since.

A poor woman near this city was covered with the most frightful leprosy I ever saw. The scabs were very numerous, large, and in many places more than a quarter of an inch thick. She had lost her eyebrows, and was so hoarse that she could hardly articulate. Many of the most efficacious medicines had been tried by me and others without success; at last she was sent to Malvern, and a little hut built for her near the well, by the charity of a neighbouring gentleman*. She used the water both externally and internally. In two or three months her skin was tolerably cleared, and she began to recover her voice; and by continuing the water, she was at length perfectly cured.

In the year 1754 I recommended these waters to a young woman, daughter to one Mr. Wilmot, a shoemaker in Bewdly. She had long had a scrophulous ulcer in each cheek, and an ophthalmy in each eye, which made her unable to bear the light, or to find her way about the house. She had continued in this condition nine or ten months, and tho' she had applied to several persons of skill, had not received much benefit from any medicines or applications

* Reginald Lygon, Esq;

When she was brought to the well, she was forced to be led by another person ; but she had not used the waters a week before she saw well enough to discover a flea leaping on her bed. Her sight is now perfect and the ulcers are healed.

A child of one Mr. Morris, a grocer in this town, about three years of age, had the submaxillary glands very much enlarged ; he had a scrophulous ophthalmia in each eye, and his lips were very much swelled, the upper one in particular projected farther than the end of the nose, which it quite touched, and was excoriated with several very deep fissures in it. He used the waters two or three months, and returned home with his eyes quite well, the lips healed and reduced to their natural size, and the glands of the neck also very much lessened.

These are a few out of the very many instances of the efficacy of these waters, which I have seen myself, hundreds might be produced : if there were occasion.

Those, who use the waters externally, usually bathe in them with their linnen on, and dress upon it afterwards wet as it is. The sores, or tumors also, are covered with linnen, which is kept constantly wet with the water. During this course they ought to drink nothing but the water, and to take that in as large a quantity as they conveniently can. This method, odd as it is, has not hitherto been found to be attended with any inconvenience. Those, who use it thus externally, are apt to find themselves hotter than usual, with an increased thirst, as soon as their tumors or sores begin to grow better ; but for these complaints they have a remedy at hand, for
by

By drinking more freely they soon go off. These symptoms seem to arise from some matter being repelled and taken up into the circulation; but as the water is so pure, it is soon washed off by it, and carried out of the habit.

Indeed the efficacy of these waters seems to be owing chiefly to their extreme purity and lightness, by which they are enabled to pervade the finest vessels, and not being loaded with any earths or salts, are capable of dissolving more than those waters which are already impregnated with them. And if we consider the ill effects, which waters full of stony or styptic particles have on the constitution, producing glandular obstructions and the like, we may in some measure conceive, how waters, which are pure and almost elementary, may assist in removing such diseases. But beside this extreme purity, the efficacy of this spring must be greatly assisted by the elastic fluid, which it appears to contain from Exp. 2, 3, 4, as well as by its bituminous or sulphureous parts, 9, 14, 15. It may also be expected to act still more powerfully (both externally and internally) if it be impregnated with any subtle tincture from copper; as is probable, not only from Exp. 5, but from the effects sometimes observed upon its first use. Besides these qualities, I suppose part of its efficacy in external application may arise from its coldness.

But whether, by any chemical analysis we can discover its principal contents, or not, so long as it is found to produce such extraordinary effects, we may there rest satisfied; experience being the best test of the nature of any spring. For however the
methods

methods of examining mineral waters may have been improved by the sagacity and industry of later chemists, it must be owned, that we are still far from perfection in that point; and perhaps the most active parts of waters, on which their virtues chiefly depend, may lie so much out of our reach, as not to be the objects of sense, or discoverable by any experiments. Dr. Winter, in his *Cyclos Metascriticus*, has a very pertinent observation to this purpose, which I cannot forbear transcribing. “ It is not necessary, says he, that waters should contain so large a quantity of the particles they have imbibed, as may be evident to our senses: for we know by experiment, that *reg. antimon.* frequently macerated in wine, loses nothing of its weight or substance, tho’ the wine proves strongly emetic. p. 40.” And may not waters be impregnated somewhat in the same way by effluvia from mineral substances unknown to us, and therefore not discoverable by any experiments?

Worcester,
Dec. 12, 1755.

J. Wall.

LIV. *An Account of the Case of a Man who died of the Effects of the Fire at Eddy-stone Light-house. By Mr. Edward Spry, Surgeon at Plymouth.*

Read Feb. 5, 1755. **O**N thursday the fourth of December, 1755, at three in the afternoon, Henry Hall, of East-stone-house, near Plymouth, aged 94 years, of a good constitution, and extremely active for one of that age, being one of the three unfortunate men, who suffered by the fire of the light-house at Eddy-stone, nine miles from Plymouth, having been greatly hurt by that accident, with much difficulty returned to his own house. I being sent for to his assistance found him in his bed, complaining of extreme pains all over his body; especially in his left side, below the short ribs, in the breast, mouth and throat. He said likewise, as well as he could, with a hoarse voice, scarce to be heard, that melted lead had run down his throat into his body.

Having taken the proper care of his right leg, which was much bruised and cut on the tibia, I examined his body, and found it all cover'd with livid spots and blisters; and the left side of the head and face, with the eye, extremely burnt; which having washed with linnen dipt in an emollient fomentation, and having applied things used in cases of burning, I then inspected his throat, the root of his tongue, and the parts contiguous, as the uvula, tonsils, &c. which were greatly scorched by

the melted lead. Upon this I ordered him to drink frequently of water-gruel or some such draught ; and returning to my own house, sent him the oily mixture, of which he took often two or three spoonfuls.

The next day he was much worse, all the symptoms of his case being heightened, with a weak pulse ; and he could now scarce swallow at all.

The day following there was no change, except that, on account of his too great costiveness, he took six drachms of manna dissolved in an ounce and half of infusion of fenna, which had no effect till the day following ; when just as a clyster was going to be administered, he had a very fetid discharge by stool.

That day he was better till night, when he grew very feverish.

The next day, having slept well the preceding night, and thrown up by coughing a little matter, he was much better.

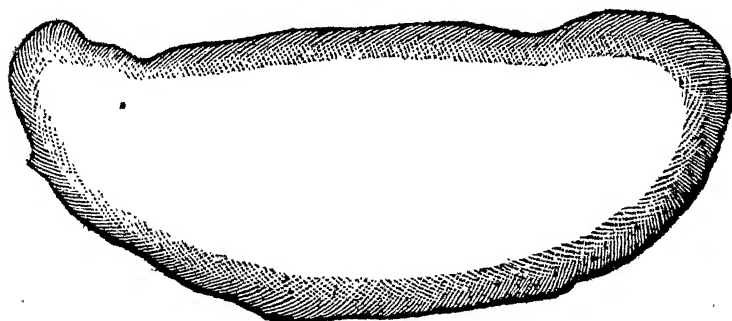
He began now to speak with less difficulty, and for three or four days to recover gradually ; but then suddenly grew worse ; his pulse being very weak : his side, which grew worse daily from the first, now reddened a little and swelled ; to which I applied the emplaster of gums. But all methods proved ineffectual, for the next day being seiz'd with cold sweats and spasms in the tendons, he soon expired.

Examining the body, and making an incision thro' the left abdomen, I found the diaphragmatic upper mouth of the stomach greatly inflamed and ulcerated, and the tunica in the lower part of the stomach burnt ; and from the great cavity of it took out a great piece of lead of the shape and weight here described.

It will perhaps be thought difficult to explain the manner, by which the lead entered the stomach : But the account, which the deceased gave me and others, was, that as he was endeavouring to extinguish the flames, which were at a considerable height over his head, the lead of the lanthorn being melted dropped down, before he was aware of it, with great force into his mouth then lifted up and open, and that in such a quantity, as to cover not only his face, but all his clothes.

Plymouth,
19 Dec. 1755.

The figure of the lead; which weighed exactly seven ounces, five drachms, and eighteen grains.



To the Right Hon. George Earl of Mac-
clesfield, President of the Royal Society.

My Lord, Plymouth, Jan. 30, 1756.

Read Feb. 5,
 1756.

AS the late case I took the liberty of troubling your lordship with, was so very singular, as to make it by some gentlemen greatly doubted, on account of their imagining, that the degree of heat in melted lead was too great to be borne in the stomach, without immediate death, or at least much more sudden than happened in this case; I herein can not only convince your lordship of its fact, by my own and (if requisite) the oaths of others, but also by the following experiments, which from similarity of circumstances must not only render that probable, but (in the most convincing manner) the absolute possibility of my assertion.

I extracted in three pieces, from the stomach of a small dog, six drachms one scruple of lead, which I had pour'd down his throat the day before.

N.B. The mucous lining of the œsophagus seem'd very viscid, and the stomach much corrugated, tho' its internal coat was no-ways excoriated.

The dog had nothing to eat or drink after; nor for twenty-four hours before the experiment, when, being very brisk, I killed him.

I also took from the stomach of a large dog (in several pieces) six ounces and two drachms of lead, three days after thrown in.

The pharynx and cardiac orifice of the stomach were a little inflamed and excoriated; but the œsophagus and stomach seemed in no manner affected.

I gave this dog an half pint of milk just before I poured down the lead; very soon after which also he eat thereof freely, as if nothing ailed him; which he daily continued to do, being very lively at the time I killed him.

From the crop of a full grown fowl, I (in company with Dr. Huxham, F. R. S.) extracted of lead one solid piece, weighing two ounces and a half, together with nine other small portions, weighing half an ounce, which lead was thrown down the fowl's throat twenty-five hours before.

The fowl was kept without meat for twenty-four hours, before and after the experiment, eating (being very lively just before we killed him) dry barley, as fast, and with nigh, if not quite, the same ease as before.

The mucus on the larynx and œsophagus was somewhat hardened.

The external coat of the crop appeared in a very small degree livid; and the internal, somewhat corrugated.

The barley was partly in the œsophagus, tho' mostly in the crop, which was almost full with the lead.

I took two ounces one scruple from the crop of another fowl, three days after the experiment, which fowl was very brisk to the last.

Allowing, for a further satisfaction, that the experiment be tried, it is requisite in making thereof, that the melted lead be poured into a funnel, whose spout being as large as the throat of the animal
(whose

(whose neck must be kept firmly erect) will conveniently admit of, must be forced down the œsophagus, somewhat below the larynx, lest any of the lead might fall therein; and according to the quantity, either by totally, or partly obstructing the aspera arteria, cause immediate, or a lingering death; which accidents happening, in my first experiments on two dogs, directed me to proceed in the above manner.

At present, I have a dog with lead in his stomach, which I intend to keep, to prove how long he may live.

My lord, your lordship may depend on it, that so far from my asserting any thing in the least degree uncertain, that, as I always have, I always shall act with so much circumspection and integrity (especially in these tender points, where my character is at stake) as to be able easily to prove what I may assert, as in the present case, so very extraordinary, that scarce any of the faculty (unless particularly acquainted with me) would give credit to, till I demonstrated it by the above experiments; which, I doubt not in the least, will be sufficiently satisfactory to your lordship, and to the honourable Society; to serve which venerable body, as much as lies in my power, will, at all times, give the greatest pleasure to,

My Lord,

Your Lordship's most obedient,

and most humble servant,

Edmund Spry.

A Letter of John Huxham, M. D. F. R. S. to Mr. William Watson, F. R. S. concerning the Case of the Man, who swallowed melted Lead.

Dear Sir,

Read Feb. 5, 1756. **I** Think there are few things remarkable, in art or nature, in this part of the country, that do not, sooner or later, come to my knowledge. Our worthy commissioner, Fred. Rogers, Esq; sent me the lead you mention, three days after it was said to be taken out of the man (Hall) who was said to have swallowed it. I immediately sent for Mr. Edward Spry, an ingenious young surgeon, of this town, who attended this Hall during his illness, and extracted the lead from his stomach (as was reported) when dead. Mr. Spry solemnly assured me, that he did actually take the lead, that was sent me, out of the man's stomach, and offered to make oath of it. This Hall lived twelve days after the accident happened, and swallowed several things, solid and liquid, during that time; and he spoke tolerably plain, tho' his voice was very hoarse. And he constantly affirmed, that he had swallowed melted lead.

However, as the story seemed very extraordinary, and not a little improbable, I did not chuse to transmit any account of it to the Royal Society, as I could have wished for more unexceptionable evidence; for Mr. Spry had no one with him, when he did extract the lead, but one woman, Philips, the daughter of Hall, and another woman, who were also in the house, not being able, as said, to see the operation, but immediately called in after it, and Mr. Spry shewed them the lead. I sent a very sensible gentleman

to

to enquire into this affair, and he had this account from them.

This Mr. Spry is, to the best of my knowledge, a person of veracity, and I think would not utter an untruth. But, what is more, last Wednesday he brought me a live young cock, into the crop or craw of which, he had the day before poured somewhat more than three ounces of melted lead. The cock indeed seemed dull, but very readily pecked and swallowed several barley-corns, that were thrown to him. I had the cock killed and opened in my view, and in the crop we found a lump of lead weighing three ounces (less twenty grains), and some other little bits of lead. I make no doubt the cock would have lived several days longer, if it had not been then killed. There seemed a slight eschar in the cock's mouth, occasioned by the melted lead, and the crop seemed as if parboiled. This experiment is very easily made, and seems to confirm the probability of Mr. Spry's account.

I never dispute a matter of fact, when I am fully convinced, that it is so; but I think it my duty to enquire narrowly into the circumstances of it, before I admit it as such. With respect to the present case, you now know as much of it as,

Dear Sir,

Plym. Sat. even.
Jan. 31, 1756.

Your most faithful and

obedient humble servant,

J. Huxham.

LXV. *A farther Account of the Success of some Experiments of injecting Claret, &c. into the Abdomen, after Cupping.* By Mr. Christopher Warrick.

Read Feb. 12, 1756. **I** Some time since did myself the honour to lay before the Society an account of an improvement I had attempted on the operation of tapping, by injecting the abdomen, after the lymph was drawn off, with astringents. This method proving successful in the case of Jane Roman, (as mentioned in the *Transactions*, No. 472) I was in hopes some gentleman of better abilities, and larger experience, would have made further tryals; but having not heard, that any attempt this way hath been made by others, and having lately met with three instances, wherein my own endeavours have failed, I am under some doubt, whether, upon the authority of a single instance, I have not been too sanguine in my hopes concerning it; tho' the seeming reasonableness of such a scheme, and the good event of it, under the very particular circumstances of that woman, still plead strongly with me in its favour.

The first is that of the poor woman at Cubert, mentioned in the *Transactions*, No. 473, who was injected with claret and Bristol water, and about a week after the operation died suddenly. She was upwards of fifty years of age.

The second instance is that of a young woman of St. Kivern, who was about twenty five, and had been three times tapped in the common way. Here we

made use of two punctures, according to Dr. Hales's method, as recommended in the *Transactions*, No. 478, and claret and tar-water for the injection; which was conveyed into the abdomen thro' one canula, whilst the dropfical lymph passed off thro' the other. A few hours after, she complained of much pain in her bowels, and on drawing off the whole contents at once, she fell into a syncope, in which she remained till about twelve o'clock of the next day, when she died. It may not be amiss to mention, that her breath was immediately affected by the tar-water, and the smell of it continued to her death.

The third instance being somewhat singular, I beg leave to relate it in all its particulars. In March, 1752, I was called to Flushing (a small town opposite Falmouth) to attend the tapping a poor woman, who was about forty years of age, and laboured, as was imagined, under an ascitical dropſy, occasioned by a suppression of her menses, that happened about twelve months before. She had been told of my success with Jane Roman, and desired my assistance, together with Mr. Rice, Mr. Cudlip, and Mr. Lillicrap, of the same profession. She was a married woman, of a chearful temper, had never had a child, and, to all appearance, was a proper subject for the operation, she being never thirsty, and her extreme parts being of the natural size: the abdomen was likewise evenly and equally distended, and of a great magnitude; but the fluctuation was not altogether so manifest as might have been expected. From these circumstances we made no difficulty to resolve on the operation, and determined to try, at the same time, the efficacy of a subastringent injection. A
suffi-

sufficient quantity therefore of claret and Bristol water being got ready, Mr. Rice, whose patient she was, made the puncture ; but on withdrawing the perforator, instead of lymph, nothing but a thick, ropy, gelatinous fluid came thro' the canula, in colour resembling red port wine, or rather grumous blood. The singularity of this did not however alter our measures. Two gallons of it were immediately drawn off, and half that quantity of claret and Bristol water injected in its stead. This we purposed to have repeated the next day, and as the circumstances of the patient would admit ; and to continue daily, till the whole contents should be gradually discharged ; fearing that a total discharge in the ordinary way would have brought on a syncope. But when we attended her again on the day following, not one drop of any fluid came thro' the canula ; and a second and a third puncture was attended with no better success. Soon after this, the whole abdomen became painful and distended, frequent rigors came on, and a delirium, in about twelve hours, carried her off. Upon opening the body the day following, not one drop of any fluid was found in the cavity of the abdomen ; an enormous cystitis, which might have contained, when full, about six gallons, having completely filled the whole extent of it. There were likewise attached to the coats of it five large bodies of fungous flesh, the least of them bigger than a man's fist. Each of these, when cut open, appeared to be divided into cells, full of white glutinous pus. This extraordinary mass adhered only to the fund of the uterus, and together with it, the fungous substances, and vagina, when taken out, intirely covered a middle sized pillar

and claw tea-table. We now found, that in the night the canula had accidentally slipped out of the cystis; and that the operator, in making the second or third puncture, had fallen upon one of these fungous bodies, which gave occasion to the above-mentioned disappointment. On proceeding to a farther examination of the abdomen and thorax, we found every thing sound, and in its proper state, excepting the posterior part of the right lobe of the lungs, which was full of purulent matter, and adhered to the pleura. I should add, that the ovaria did not distinctly shew themselves, so as to satisfy any enquiry about them; but this perhaps might be owing to the hurry or inaccuracy of the dissector.

Whether these miscarriages are sufficient to discredit a method of practice, which hath the appearance of being the most rational one yet found out for handling a dropfy, I leave to the determination of better judges. The frequent miscarriages, that happen in the ordinary way, seem sufficient to justify every attempt to render the success of it less precarious. If any further tryals of it be made, I would beg leave to recommend its being done before the viscera are too much injured by the dropfical lymph; and if the evacuation be made at different times, with a view of preventing a syncope, (as was proposed in the last instance) that brandy, or some such liquor, properly diluted, be made use of instead of claret, which, as I apprehend, by the heat of the body, may be apt to turn sour. It may be likewise proper, that the head of the patient, during the evacuation, lies lower than any other part of the body.

As in the second instance above-mentioned, tar-water had been recommended by some gentlemen of the profession, then present, instead of Bristol-water, I, some time after the death of the patient, injected a pint of it warm into the belly of a small cur, to see how far the effect of it differed from that of claret and Bristol water. The dog immediately fell into great agonies, and in about two hours died. The abdomen being opened, all the intestines were found greatly inflamed. I then tried claret and Bristol water, also port wine and fountain water, on other dogs, after the same manner. Each of these injections was retained with little or no inconvenience, except intoxications: and in forty-eight hours the dogs became well again, the injection being intirely absorbed. It occurred to me, in making these experiments (wherein the power of absorption seemed very considerable) how far it might answer in preventing a syncope, or for other purposes, that a fit quantity of a properly adapted injection be left undischarged, after tapping, which might be either absorbed, or drawn off at proper intervals, as the strength of the patient may admit. I am, with great respect,

S I R,

Truro, Jan. 21,
1744.

Your most humble Servant,

Chr. Warrick.

LXVI. *An Account of the late Discoveries of Antiquities at Herculaneum, &c. in Two Letters from Camillo Paderni, Keeper of the Musæum Herculanei, to Thomas Hollis, Esq; Translated from the Italian by Robert Watson, M. D. F. R. S.*

An Extract of a Letter from Camillo Paderni, dated at Naples June 28, 1755.

HIS majesty the king, my master, is always increasing his taste for matters of antiquity, which he loves with the zeal of the most passionate antiquary; for he not only makes all the necessary trials and inquiries in these cities, which have been covered by mount Vesuvius, but extends his researches into other parts of his kingdom; and buys also, with great pleasure, every piece of antiquity of value, that he can meet with. Fortune second his endeavours, and makes him at this day one of the happiest virtuosi in Europe; and we may say, that he hath no occasion to take pains to seek for good fortune, for she always attends him; as Sir, you, may see in the following instance. In April, his majesty was acquainted, that a little beyond La Torre della Nunziata, where stood the ancient Pompeii, in digging near the amphitheatre, there was discovered a marble capital of the Corinthian order, and that it was necessary to examine farther into what might be there. His majesty had formerly caused some workmen to dig in this place, but upon account of a certain vapour or memphites, which arose here, and which was so active, as to destroy any one, who remained ever so short a time

time in it, his majesty suspended the work: but being assured, that this vapour had ceased to arise, he ordered one of his engineers, who had visited the place, to make the necessary trials to begin again. Immediately there were found two pilasters of white marble about ten feet high, fluted on every side, with capitals and bases of the Corinthian order. On one side of these pilasters they have found a series of nine other pilasters about seven feet high, equally wrought with the larger: there were likewise five other pilasters on the side of the other great one, which in all will amount to sixteen; and are of one piece, exclusive of the capital and the base, except one, which is composed of two pieces. They were all excellently preserved, and were standing; forming a portico before a building; the nature of which I cannot undertake to explain, because I do not care to commence author from the relation of others, before I have examined things with my own eyes. I can only write what I have seen. When I was there, little was discovered, and I have not since had an opportunity of going thither on account of my bad state of health. By this one view I could perceive, that this was a great square building. All the buildings, which are in Pompeii, are of the same constitution with those of Herculaneum and Stabiae; that is to say, of one story. I did not see the whole of the supposed front of this fabric, and so cannot determine decisively about it, till the whole be cleared by digging. The portico is continued on the sides, but the pilasters are not of marble, but of brick covered with stucco, and coloured with green, and are not fluted like those of marble. One then only of the sides is yet undiscovered, and we must wait to see

see the side opposite to the front, and the rooms within, to be able to speak decisively. But to return and speak of the front; I can tell you, that it was all painted in the grotesque manner; but little, and that ill preserved, remains. There were no ornaments of stucco, or marble; the walls indeed were coloured, and there were some small niches formed in the walls, each of which corresponded to one of the pilasters, and consequently there were eighteen in number. In several of them were found certain figures, some of earth, others of marble, in this order; first was placed one of marble, then one of earth: those of marble were 9 small Hermæ, among which there is a Hercules crowned with oak, some satyrs, fawns and Bacchantes. Two of them are of the old red, and the other of the old yellow marble, and are of an indifferent style. Those of the baked earth consist of four figures. The first is a Barbarian king, who stands erect with his right hand under his chin in a pensive manner, and wears his chlamys clasped with a fibula upon his right shoulder. But what makes this figure the more curious is, that the whole body forms a vase, on the back of which there is a handle to hold it by. Behind the head there is a little tube, through which water or some other liquor was poured in, and the mouth of the figure is open, through which the liquor was poured out. The height of it is about ten inches, and the style rather low. The second figure is of the same height and character, as to the workmanship; but what it represents, renders it singular. I will content myself with describing its action and its ornaments, and leave to others the explication of the

rest. This figure seems sitting with its legs stretched out, which are distorted like those of some dwarfs. It has a great head; the mouth, eyes and nose of which are extremely overcharged. It is dressed in the prætexta. Upon the breast there is the bulla aurea, the string of which surrounds its neck, and is held with the right hand; with the left it holds the tablettes called pugillares, on which the ancients placed wax, and wrote on it with a style. These pugillares are exactly like those, which I dug up at Herculaneum, and which I preserve in that museum. Besides it bears a great Priapus, and behind is seen the breech. This was made for a vessel, such as that described above, except that besides that the mouth of this figure is pierced, the liquor can also be poured from the Priapus. The third figure is intirely like to the preceding, except its dress, which is rustic, and bound round the waist with a cord, to which there is fastened somewhat, that cannot be made out, but which appears to be a little case to hold something: the rest is not overcharged, but is rustic. It holds in its right-hand a loaf, and its left hand is covered with its dress, and, like the other, it shews its breech and Priapus. I am of opinion, that such vessels were used for drinking, the liquor coming out of the Priapus, this being not unusual with the antients, as Juvenal, in his second satyr, gives us to understand; *Vitreo bibit ille Priapo*.

The last figure represents the Roman charity. She is sitting, and with her left hand embraces her father, and with her right presses the breast which her father sucks; who is expressed in this figure totally emaciated. This doth not, like the others, form a vessel,

but simply exhibits the story. The style is moderate, its height near the same as that of the others. It is to be observed, that this last groupe is covered with a varnish or glazing, like that which covers earthen plates and things of that kind. There were found in the before-mentioned niches two little busts of baked earth, of the same height; one wants the head. This is all that is found in that part of the building, which I suppose to be the front.

There is no doubt but that formerly others have dug at Pompeii, and particularly in this very spot, which the miners, who are expert and faithful, have perceived. As our miners had at first great skill and diligence, so they are become by time more perfect, inasmuch that none can execute better than which they do, particularly in digging at Herculaneum, where they never see the light, but at the hours set apart for rest. These were the first, who discovered, that others formerly had dug more, by certain strokes, the marks of which remain on some of the pictures, which are on the walls of that chamber, which was the second that they discovered.

Their opinion is confirmed by the matter, which fills up the said chamber, not being in the same state that it usually is. So that we may conclude, that they have formerly dug here, but irregularly; fortune having a mind to reserve the best part for the king my master. There are several pieces of painting cut out, which cannot yet be well seen, because they are in their cases.

If those, who before his majesty dug in this place, had done it regularly, in my opinion they could not

have missed a treasure, which is found in a little closet, the dimensions of which are about six feet in length, and four in breadth, discovered the 13th of last month. In this place was found a very fine tripod about three feet high, extremely well preserved. In short, it is one of the most beautiful pieces of antiquity in the whole world. It is formed of three satyrs, young, and all exactly alike. Their heads are most beautiful, with a chearful countenance, and the hair well disposed with a ribband, that surrounds the head. Upon the forehead there stand two small horns, which are united. The right hand rests upon the side of the body, and the left is open, with the arm somewhat extended. They have a great satyresque priapus. The legs are united, and they place their feet upon round bases, which have been turned in a lathe, and then covered with leaf silver. Their tails are twisted round a ring, which is suspended thereby. The three satyrs support with their heads the hearth of the tripod, which is of excellent workmanship, and hath three moveable rings, which serve to remove the tripod from one place to another. One of these rings is wanting, and could not possibly be found. Whence we may suppose, that anciently it was likewise wanting. Upon the hearth there is another ornament united to its circumference, and forming a kind of radiated crown, which crown hath also two handles, but not moveable. These serve to place the crown upon the hearth. Among other particularities, it is observable, that the bottom of the hearth is not of brass, like the rest of the tripod, but of baked earth. The above-mentioned closet, where this tripod was found, is all painted, and intire, with the

cieling unhurt: In the walls of it there was a table of white marble fastened in the wall itself, which we might call a side-board, and which was extended along the sweep of the room. Upon this table was found a crescent of silver, about 5 inches in diameter, and on the edge of its middle there are two small holes to receive a string to support it. Perhaps this was an amulet, for we have another of the same metal, but smaller, with its supporter of silver, which hath been long found. Upon the same table there was another amulet of silver about an inch in height, which represents Harpocrates. This figure hath its finger near its mouth, the lotus on its head, and wings on its shoulders. On the right shoulder hangs a quiver, and its left arm holds a horn of plenty, and leans upon the trunk of a tree, round which there is a serpent, and at the foot of the trunk there stands an owl. There was found a kind of fibula, for such I take it to be, which is of gold, and is extremely well preserved. Its form is round, and made like a great button. On the back there is a gold wire fastened to one side; the other end of which is fastened in a small piece of gold, that is soldered into the fibula. The whole is little more than an inch in diameter. There are found also two other figures; one is of marble about a foot high, and represents a woman; it is of no great value: the other is of ivory, but there remains nothing but the name, and a part of the face, by which may be perceived, that it is the work of an excellent Greek hand. All the rest consists as it were of minute leaves, which are so brittle that they cannot be united. Its height is about a foot.

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What I am now going to describe, was found in the same clifet, upon the same marble table, and is one of the most beautiful statues, which I ever saw, and so admirable, that I know not how to begin to describe it. I will first tell you its height, which is little more than three inches, that you may conceive what pains have been taken with it. It stands upon its feet and is quite naked, and represents a Priapus, which is not satyresque, with a most perfect contrast of attitude. One observes through the whole figure a most perfect skill in anatomy, where the smallest muscle is not lost, and at the same time it seems not dry or hard, but palpable flesh. It is of a noble and excellent style. Its head is somewhat rustic, with a goat's beard and ears. It hath a laughing countenance, turning its head with much grace, and brings its first finger of the left hand to its face. It extends and raises its right-arm, which terminates in a manus impudica. Our Neapolitans and I have seen the same in our peasants about Rome, who frequently wear in their hair a pin, the head of which consists of such a hand; and they say, that they wear this against an evil eye; and in Naples I see some of these pins worn by children. We have found several of these small hands at Herculaneum. It is observable, that these Priapi frequently had this hand; for among the many, which remain under my care, there is one with human ears, and with this hand, which together with the whole arm forms a Priapus. But let us return to our figure. The head is covered with a cap, which is folded down behind; and its base is low and round, and well fitted. In fine this may be called one of the most excellent curiosities.

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In one of the other rooms there was a fine pair of scales, in which there are some remains of the strings made of a kind of fine coral, and the strings remain in some of the rings. There were found likewise many vessels of earth and fragments of metal.

In the ancient Stabiæ they go on digging ; but it is long since any thing of value hath been found, except that in the beginning of this month two small statues of brass were discovered. One represents a Venus, but of no value. The other a Panthea with a rudder, horn of plenty, lotus, modius, and sickle. It is but of ordinary workmanship. Many vases of earth, some of glass, have been found. A great vessel of copper with a handle, a singular funnel, a beautiful little vase of rock-crystal with its cover, and a simpulum or ewer, divers medals, as well silver as copper, well preserved, but common, and various pieces of leaden pipes, have also been found there.

The same may be said of Herculaneum ; for since the month of March, after the colossal bust of brass was found, they have discovered nothing of value except one thing, which ought to make much noise among the learned, and which I believe to be the only one of its kind in the world. This is a little leg and thigh of metal covered with silver, and which is five inches long. Upon the external part of it is described a sundial formed upon a quadrant, and as the thigh forms a quarter of a circle, the workman hath taken the center of this quadrant from the extremity or leg of the gammon, and hence hath drawn hour-lines, which with the lines, that mark the months, form the usual compartments, some larger and others smaller, which are divided six by six,

fix, as well in height as length. Below the inferior compartments, which are the less, are read the names of the months placed in two lines in a retrograde order, so that the month of January is the last in the first line, which bears the other five following months. In the second line are described the six other months in their natural order; so that the month of December is under January, and so the months shorter and longer, two and two, have one common compartment for each couple. Almost on the edge of the right side, there is the tail of the animal somewhat bent; and this performs the office of the gnomon. On the extremity of the bone, that is, of the leg, or center of the quadrant, there is a ring to hold the dial in an equipoise; and it is supposed, that in that place was fastened its plummet, such as in the like dials is to fall upon the present month to determine the shadow of the gnomon upon the horary lines. It is observable also, that as these dials were described upon a plane surface, according to a fixed rule, the surface of this metal ham being in one place concave, in another convex, one cannot easily guess what rule the workman used to describe a dial of so difficult a kind, upon a plane so irregular. This dial was found the eleventh of this month, and was delivered to me; but it was not known what it was, because it had a cover upon it, so that the miners took it only for a piece of iron. My curiosity soon led me to examine it. I began to discover the shape of a ham, however I could not persuade myself, that it was so; but afterwards finding, that it was silver, and perceiving the lines, which form the compartments, and the cha-

characters, which denote the twelve months, I had no doubt about it. I was so pleased with such a discovery, that I went directly to the royal garden, where the king and queen were, to whom I presented it, and to whom it gave great satisfaction. This is all that hath been found in these three places, by digging, since my last letter dated in march.

I must not neglect to acquaint you with what hath been found in a trial, which his majesty made at Cuma, where were situated some sepulchres, which afforded many curious things; an account of which you will not be displeased to read. In May last, our miners opened a tomb of the family Pavilia, which formed a small chamber. On the floor there were three corfes, or rather their bones, which were included in four pieces of the piperine stone. These four stones formed for each corps an oblong case. The engineer, who was present at the discovery, told me, that one of these bodies was all covered by a substance unknown to him; but from his relation I comprehended what it was. The corps was covered with a cloth of amianthus, which, as it was large, remained in this situation all on a heap, but calcined by the salts of the earth, for which reason it was necessary to take it up in pieces, it being become extremely brittle. However, to be more sure of my opinion, I had a mind to try it in the fire, where it remained unchanged; whence there is no doubt but that it is amianthus. There were found a great many little pieces of paste as big as beans, which were taken by the miners for confits, but are the confection, which used to be put upon dead bodies. They are composed of myrrh and other spices, and
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even now retain a very strong smell. There was found some cloth reduced almost to nothing, which had some ornament of gold embroidered upon it, or rather wove into it, as is more probable from the gold thread. Upon the above-mentioned body were found some pieces of paper, for I have great reason to think it such from the trials, which I have made upon the old papyrus, of which we have about eight hundred volumes. Now I think these pieces to be paper, because they are composed of a matter, which is like that, of which our paper is made; but however I will not pretend to be quite sure; I only plainly give my opinion. This paper on one side is coloured with red minium, on the other it is black. Perhaps they used this sort of paper to write upon, to denote by the colours the happy or unhappy state of the writer. Ovid gives us an example of this in the first elegy of the first book *De Tristibus*.

*Nec te purpureo velent vaccinia succo,
Non est conveniens luctibus ille color :
Nec titulus minio, nec cedro charta notetur,
Candida nec nigrâ cornua fronte geras.*

I think I may with reason judge these fragments to be paper; but I always am ready to submit to the opinion of the more learned. But as every one may speak his thoughts, so I have spoken mine. Besides this paper there were found a mirror of metal, and three tesserae, which we call dice. Under the corps or bones was found a padlock, through which were passed three iron strigils, and another that was broken. It is remarkable, that in all the other sepulchres, that were opened at Cuma in the month of

May, there were found a mirror, three tesseræ, strigils, and some very small fibulæ of bone. In the above-mentioned sepulchre was found a small lectisternum, or rather pulvinar deorum, which was very much decayed. It is mounted in iron. The ornaments, which compose it, being of ivory, the rust of the iron hath as it were destroyed the whole. So that there were collected but a few remains of the four pillars, some pieces of the bands, which went round the frame, eight pieces of ivory, of an oblong form, in each of which was engraved a figure of some unknown deity, all of the same design, but in a bad style; and two heads of a horse, which are fellows, and belong to the lectisternum, not unlike that great one of brass, which is now in the royal museum. There were found also several little vases of earthen ware, whose form is this: They have a long neck, with a mouth proportionably straight; the body is oval, which towards the bottom is so small, that they cannot stand upright. The misfortune is, that two of these vases, which are of oriental alabaster, and of the most excellent workmanship, are both broken in the middle.

Near this sepulchre there was opened another, belonging to the freed men of the Pavillia family. There we found many glasses and pieces of earthen ware, and two most beautiful earthen lamps. On one of them there is an Hercules going to slay a serpent with his club, which he holds in his left hand. On the other, there is a priestess of Bacchus, which in one hand holds the sacrificial knife, and in the other the half of a victim. Besides there are two very small wine-glasses, which contain, the one a liquor of the colour

color of red wine, the other a liquor more limpid than white wine, but without any smell. In this tomb were found likewise the usual dice, strigils, mirrors and fibuæ. The bones and ashes were in urns made of earth.

Four other sepulchres also have been opened, in all of which were found the usual strigils, mirrors, testerae and fibulae. In one of them was found a little earthen urn with its cover. Within the same tomb there was a small urn of glass elegantly made, containing the ashes of a child. Near the said urn were found several little things, which probably were the playthings of the child; these were two very small goblets of baked earth glazed, with a handle to each; two small water-ewers, of the same materials, with ornaments; these also are extremely small: another vase of common earth, which forms a recumbent ox, on the back whereof there is a hole to receive the water, which was poured out through the mouth; and there is a handle on one side of the body. In this same sepulchre was found a monstrous Priapus of red earth. This figure hath wings, and is much over-charged. All these things, which I have described, are preserved by me in the royal museum, in a separate apartment from, that, in which is preserved what hath been found at Herculaneum, Pompeii, and Stabiae. I have already filled eight chambers with antiquities; and because those are not sufficient, I shall begin to place many other things, which hitherto I have been forced to keep in confusion, in other chambers, which are on the same floor. I hope to have the pleasure to see you again in Italy, to admire this treasure, with the sole care of

which his majesty hath been pleased to honour me, A single volume of the Papyrus is unfolded, which is that, which treats of musick. At length the name of the author, who was called Philodemus, is found written twice, at the end of the piece. The name is written once in a small, and a second time in a large hand, and in a good Greek character. They are now beginning to open, or rather to unroll another manuscript; but hitherto without much success: From some fragments one may collect, that it treats of Rhetoric.

This is what I have to say at present; and for the future, I will not fail to write to you, whenever any thing of value shall be found. I am sorry to send you a letter full of blots and ill expressed; but, my friend, I have taken up my pen and stolen a little time to write hastily to you; for I have so much business, that sometimes I have not even time to dine; so I hope you will excuse me.

Dr. Watson begs leave to make the following Observations.

I think it probable, that Philodemus, the author of this treatise on music, was the Epicurean philosopher of that name, who was, as Strabo informs us, a native of Gadara in Syria. He wrote many pieces in prose and verse, and his tenth book *περι των φιλοσοφων συνιξεως* is quoted by Diogenes Laertius. Indeed his sect, time and abode, will allow of the supposition of his writings on music being at Herculaneum at the time of its destruction. He resided at Rome, and was the acquaintance of Tully, and the
pre-

preceptor of Lucius Piso the consul. We learn from Asconius Pedianus, that it is Philodemus the Epicurean, of whom Cicero speaks with that admirable mixture of praise, and invective, and excuse, in his oration against Piso; wherein he says, that he knew him to be a man of elegance and polite literature: That it was from him that Piso learned his philosophy; which was, that pleasure ought to be the end of all our pursuits: That indeed the philosopher did at first divide, and distinguish the sense, in which that maxim was to be understood; but the young Roman perverted every thing to make it favour his inclinations and pleasures; and the Greek was too polite and well bred to resist too obstinately a senator of Rome. He then tells us Philodemus was highly accomplished in philosophy, as well as polite literature, which other Epicureans were apt to neglect: That he wrote verses, which were so sweet, so elegant, and so charming, that nothing could exceed them: That he was betrayed into a too hasty friendship with Piso, from which he could not disengage himself without the imputation of inconstancy; and that *rogatus, invitatus, coactus, ita multa ad istum de isto scripsit, ut omnes libidines, omnia supra, omnia cœnarum conviviorumque genera, adulteria denique ejus, delicatissimis versibus expressit.*

I have met with some epigrams of Philodemus yet extant, some of which are, in my opinion, most facetious and elegant. We might have had many more, had not Planudes, as the Scholia informs us, rejected such out of his collection, as he thought too loose and voluptuous. Horace seems to have had some of these epigrams in his eye more than once,
when

when he wrote his second satyr of the first book; particularly where he says,

—*Hanc Philodemus ait sibi, que neque magno
Stet precio, nec cunctetur, cum est iussa venire.*

Is not this almost a translation of the

καὶ παρέχουσα

Πάντα, καὶ αἰτῆσαι πολλάκι φειδομένη.

I will give the whole epigram, as a specimen of the style and manner of Philodemus; but must beg, that in reading the third verse you would recollect what Homer says of the girdle or cestus of Venus, that it contained all kinds of delights and blandishments, love, persuasion, and desire.

Φιλοδήμος ἐπίγραμμα.

Μικκὴ καὶ μελανῆσα Φιλαίνιον, ἀλλὰ σελίνων

Ὀυλοτέρη, καὶ ἀμνῶ χρωτὰ τερειοτέρη,

Καὶ κεστῶ φωνεῦσα μαγωτέρα, καὶ παρέχουσα

Πάντα, καὶ αἰτῆσαι πολλάκι φειδομένη.

Ταυτὴν στέργοιμι Φιλαίνιον, ἄχρῃς ἂν ἔνῳ

Ἀλλῇ, ᾧ κρυσέη Κύπρι, τελειοτέρῃ. *

Upon the whole, I think we may hope for much entertainment from reading this new-discovered piece on music; and tho' the subject, on which it is written, may not be in all its extent perfectly understood, yet we may indulge ourselves in the agreeable expectation of finding, in a treatise composed by Philodemus, learning, wit, and fine writing.

Extract

* Since the death of the very learned Dr. Watfon, which happened March 2, 1756, soon after his translation of these two letters of Camillo Paderni, and his observations upon the former, were read at the Royal Society, another Epigram of Philodemus has been taken notice of, published at Leipzig in 1754, by the celebrated

*Extract of a Letter from Camillo Paderni, dated
at Naples, July 29, 1755.*

Read 12 and 19
Feb. 1756. **T**HE principal reason of my writing
to you at this time is a cameo
of great excellence found the 9th of this month, in
the morning, while their majesties were at table,
where I presented it to them, to whom it gave great
satisfaction, and was extremely admired by all the
nobility who were present. This cameo is in alto-
relievo. It is about an inch and a half long, and
almost as much in breadth. It represents a half-
length of Ceres. The head is in profile, and hath a
noble and beautiful air. It is turned, together with
the body, a little to the left. The left arm is a little
raised, and holds in the hand some ears of corn.
The right arm is lower, and close to the body. The

celebrated Mr. Reifke, which appears likewise to have been alluded
to by Horace, in the passage in part cited above from his second
satire of the first book. ver. 120.

*Illam post paullo, sed pluris si exierit vir,
Gallis: hanc Philodemus ait, sibi, &c.*

Upon which Dr. Bentley has the following note:

*Gallos hic spadones et Cybeles sacerdotes accipio; qui tam lentas am-
bages facile et patienter ferre queant. Si Philodemi epigramma ex
angulo aliquo erucretur, tum certius scire possemus utrum Γάλλος
vellet an Γαλάτας.* The epigram is as follows:

Ἐνὶ μύχοις κραδίας δοῖς περιθάλλω ἔρωτας,
τὸν μὲν Ρωμαίδες, τὸν δὲ Κορινθιάδος.
Ἡ μὲν ματρῶνας τε τρόπας, καὶ ἠθεα σέργειν
οἶδ' ἀπὸ κεκρυφάλω μέχρ' ἐκ περισκελίδων.
Ἡ δὲ χύδην παρέχει πάσῃ οἰλότῃσι προσωπῶς
πλασουργῶσα τύπος τῆς Ἐλεφαντιάδος.
Ἄν δὲ μίαν τάύλαιν, Πάσον, μ' αἶρεν' ἐπιέλλεις,
Ἐμ' Εὐφὼν μίμνω, τὴν δ' ἄρα Γάλλος ἔχει.

right

right hand takes hold of part of a fine garment, or shift, with which the figure is in part covered. The head is adorned with a diadem; and the hair, which is of excellent workmanship, flows upon her shoulders, tied with a single ribband, which rests upon her neck. The stone, of which the head is composed, is pellucid, and the rest of the figure is cut out of a chalcedony by a Greek master: it was found at Stabiæ, where they continue to dig. In the same place were found also buried several vases of metal and glass very well preserved.

At Pompeii within these few days was found a most beautiful wine-strainer, small, but finely pierced, in a better taste than those already found, which are of brass. In this same place was dug up an ink-standish, with some of the ink, which I likewise preserved. There hath been met with likewise an iron ax. There have been found, and they go on daily to find, many pictures. If the ancients had not dug in this place, we should have discovered many more things; for we find that they have taken away even some of the pictures. At Herculaneum, tho' they go on digging, nothing hath been met with for some time: we do not therefore despair, but go on with the work as before; for it hath often happened, that one fortunate day hath made amends for the preceding want of success. It is enough, that this royal museum is continually increasing; and whether it be from Herculaneum, or Pompeii, or Stabiæ, it is always a great satisfaction to his majesty, and to the learned world. When any thing else of taste and value is discovered, I will not fail to give you an account of it in the same manner as I have begun.

LXVII. *An Account of the Earthquake felt at Glasgow and Dumbarton; also of a Shower of Dust falling on a Ship between Shetland and Iceland; in a Letter from Dr. Robert Whytt, Professor of Medicine in the University of Edinburgh, to John Pringle, M. D. F. R. S.*

Read Feb. 19,
1756.

THE earthquake at Glasgow and Greenock happened in the night between the 30th and 31st of December, nearly at the same time. It was felt at Glasgow, as I am informed, by almost every person that was awake, and out of bed, and also by some in bed, who were not fast asleep. There were, according to most accounts, three successive shocks, or risings as it were of the earth. It was felt not only at Glasgow and Greenock, but also at many other places in the neighbouring country; particularly at Dunbarton; as you will see by the copy of a letter I send you inclosed, which gives a more particular account of the earthquake there than I have been able to procure from Glasgow.

S I R,

Dunb. Jan. 17, 1756.

IN answer to yours relating to the earthquake felt here, there happened but one shock, and that very moderate, on the 31st of December, before one o'clock in the morning. The agitation was very sen-

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sibly

sibly perceived by some who were in bed, and by Mrs. Weir and others who were still up. It had a sensible effect upon some birds in cages, and tame fowls; they seemed both alarmed, the first fluttering very much, and the latter making a croaking noise, as in a great fright. It shook the board out of one cage, and spilt the water which was in the glass. It was equally felt by those, who lived in ground-floors and in the second and third stories. Some sconces in Mr. Colquhoun's house were observed to vibrate during the shock: but nothing more happened worth notice. I am, &c.

As it may not be unacceptable to the Royal Society, or you, to be informed of the following fact, which I suppose you have not heard of, I was at some pains to enquire particularly into the truth of it; about which I think there can now be no doubt.

“ By a letter now in my custody, from a passenger on board the ship _____ belonging to Mr. David Loch, merchant in Leith, and bound from Leith for Charles-town in South-Carolina, we are informed, that upon the night of the 23d or 24th of October last, when the weather was quite calm, a shower of dust fell upon the decks, tops and sails of the ship, so that next morning they were covered thick with it. The ship at this time was betwixt Shetland and Iceland, about 25 leagues distant from the former, and which was the nearest land.”

There were other letters came to this place, and to Leith, from passengers on board the same ship, confirming the truth of what I have related, and containing some of the dust. This shower was probably

bly owing to the great eruption, which happened to the mountain Hecla in Iceland, in October. I am, &c.

Edinburgh, Feb. 10,
1756.

Signed Robert Whytt.

LXVIII. *Extract of a Letter from Mons. Bonnet, F.R.S. to Mr. Trembley, F.R.S. dated at Geneva, 30 January 1756, concerning the Earthquake on the 14th of November, 1755, in Valais in Switzerland. Translated from the French.*

Read Feb. 19, 1756. **V**ALAIS is thought to have been more shaken by the earthquake than our city and its neighbourhood. I procured a letter to be written to Brigue for a particular account of it. The following is an extract of the answer of a merchant of that town, to whom the letter was addressed. I should have been glad to have had some information concerning Brigue itself, which is said to have suffered considerably; but you will find, that this merchant says not a word of it. I shall make a fresh inquiry.

Brigue, January 26, 1756.

THE earthquake felt here, happened on the 14th of November, at three in the afternoon. It proceeded from the North, and lasted a minute. The earth opened on the mountain; and the opening

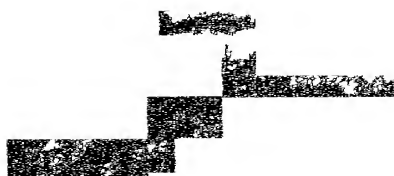
ing was large enough to thrust one's hand in, and no bottom can be found. In another part of the mountain the earthquake opened a spring sufficient to turn two mills. It continues to run near the Rhone. It is remarkable, that before the earthquake there was no source of water in that place. The earth has been opened in another place. The opening is round, and no bottom can be discovered. The earth continues to shake almost every day, but these shocks are much gentler than the first. People here are under extreme apprehensions. Most of the inhabitants are retired into the mountains, where they lodge in wooden houses, which are safer than those in the city.

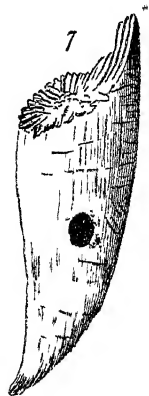
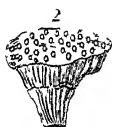
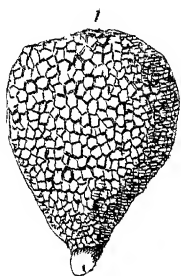
LXIX. *Extract of a Letter from Mons. Allemond, Professor of Natural Philosophy at Leyden, and F. R. S. to Mr. Trembley, F. R. S. Translated from the French.*

Leyden, Jan. 27, 1756.

Read Feb. 19,
1756.

ON the night between the 26th and 27th of the last month of December, 1755, between eleven o'clock and midnight, there was a considerable earthquake on the frontiers of this country. It was felt at Liege, Maastricht, Nimeguen, Arnheim, and, according to some accounts, at Breda. There were three different shocks, the last of which happened at about four in the morning, but





but without any noise or accident. I have been informed by letters from Switzerland, that several shocks were felt there, and that the salt-springs of Beviex have been rendered more salt.

At Amersfort, in the province of Utrecht, on the fifteenth of this month, was felt a shock of an earthquake, which occasioned great consternation, but no damage.

LXX. *An Account of some Fungitæ and other curious coralloid fossil Bodies; by Thomas Pennant, Esq; Communicated by Mr. Henry Baker, F. R. S.*

Read Feb. 19, 1756. **F**IG. I. (TAB. XV.) was found in the limestone quarries in Coalbrooke-Dale Shropshire, the greatest magazine of coralloid fossils, that I am acquainted with.

The length of this elegant body is equal to that drawn, and its greatest diameter (which is near the top) is about an inch and half. It is exactly of the form of a pear, with a small portion of stalk remaining; and its whole surface is covered with small shallow polygonal cells, the stalk excepted, which is perfectly smooth.

Fig. II. is a small fungites from the same place, of the same size with the figure; the top is convex, and thick set with minute circular cavities; the stalk tends to a conoid form, and is coarsely striated lengthways.

Fig.

Fig. III. has a very deep cup-like cavity in it, the bottom of which is very finely radiated; the remaining part covered with small tubera, not unlike those, that sometimes are seen in the insides of flints and pebbles.

Externally it is irregularly cellular, but the stalk is striated.

Fig. IV. is a very singular body, and the most remarkably shaped fungites I ever saw, being exactly oval on one side, and flat the other, without the least appearance of stalk. The oval or lower part is reticulated with polygonal cells, like Fig. I. The flat or upper part is striated semicircularly, the striæ passing from one side to the other, and then reverting.

Fig. V. This I received out of Italy, under the name of *lapis subhuteus Veronenfis stellis majoribus*. The surface is finely marked with star-like cells, which are elegantly striated from their center; and their edges rise a little prominent. The lower part of this stone is of a conoid shape, and irregularly indented with coarse circular rugæ.

Fig. VI. was found at Coalbrooke-dale, is of a white colour, and very smooth both on the sides and top, without any appearance of striæ: but what renders this very singular, is the remarkable thinness, its greatest diameter not exceeding the eighth of an inch.

Fig. VII. was found at the top of one of the highest mountains in this county, near Caer-gwrle, in a reddish loamy soil, together with various other diluvian remains.

It is of a conoid shape, but considerably incurvated; the sides are striated lengthways, and likewise circularly, but the circular striæ are much less frequent than the others. At the thicker end there appears to have been a deep cup-like cavity, the greatest part of which had by some accident been destroyed, but what remains is radiated with thin and very prominent ridges placed at equal distances from each other. On one side is a small flat fungites.

Fig. VIII. is a fungites from Coalbrooke-Dale, seemingly formed of three or four smaller, inserted one into the other. It has the same cavity on the top as the former, with a minute striated concha anomia in it.

Fig. IX. This fungites is almost straight, has a small cup like striated cavity on the upper end, is encompassed with prominent ridges on the sides, and is striated lengthways.

Fig. X. This species came from Piedmont, and differs from all the rest. It may be called an echinated fungites, having six orders of sharp-pointed fluds running lengthways from top to bottom, and between each order appear some very minute longitudinal striæ. The upper part, instead of a cavity, is composed of several thin lamellæ rising above the sides.

Fig. XI. is a Coalbrooke-Dale production, and is a cluster of fungitæ, tho' only two appear in the figure.

This varies from some of the foregoing in the shape of its head, in the middle of which is a shallow circular cavity, its sides rising a little prominent, and

and the striæ, which commence the inside, pass over the ridge, and are continued to the edges.

I am indebted to the same place for the XIIth Fig.

The cup-like cavity in this is pretty deep, and radiated with deep strigæ: and the fides are marked with very distinct ridges running lengthways, tho' sometimes interrupted by circular furrows.

LXXI. *An Account of Inoculation by Sir Hans Sloane, Bart. given to Mr. Ranby, to be published, Anno 1736. Communicated by Thomas Birch, D. D. Secret. R. S.*

Read Feb. 19, 1756. **I** Had heard by several reports from China and Guinea, but especially from Turkey, of the inoculation (as it is called) of the small-pox; and took an opportunity, when the late Dr. William Sherrard was consul of the English Nation at Smyrna, to desire the favour of him, it being an operation never practised in these parts, nor by some physicians thought practicable, to inform me of the truth and success of it. In answer to which he told me, that the consul from Venice residing there, a physician, Dr. Pylarini, had taken particular notice of that practice, and had promised to satisfy me about it; which he did by a letter, which was printed in the *Philosoph. Transact.* in 1716, and I believe at Venice.

This notice lay asleep till the hon. Mr. Wortely Montague, who being ambassador from England at
the

the port, and the lady Mary had inoculated their son at Constantinople, and wrote about this practice, and the advantages of it, to the court and their acquaintance here, and afterwards brought into England their inoculated son, in perfect health.

The princess Anne, now princess royal of Orange, falling ill of the small-pox in such a dangerous way that I very much feared her life, the late queen Caroline, when princess of Wales, to secure her other children, and for the common good, begged the lives of six condemned criminals, who had not had the small-pox, in order to try the experiment of inoculation upon them. But Mr. Maitland, who had inoculated at Constantinople, declining for some reasons to perform the operation, lest it should be lost, I wrote to Dr. Terry at Endfield, who had practised physic in Turkey, to know his opinion and observations about it; who returned me this answer, that he had seen the practice there by the Greeks encouraged by their patriarchs; and that not one in eight hundred had died of that operation. Upon my speaking to Mr. Maitland, he undertook the operation, which succeeded in all but one, who had the matter of the small-pox put up her nose, which produced no distemper, but gave great uneasiness to the poor woman. After their recovery, in order to obviate the objection made by the enemies of this practice, that the distemper produced by it was only the chicken-pox, swine-pox, or *petite verole volagere*, which did not secure persons against having the true small-pox, Dr. Steigertahl, physician to the late king, and I, joined our purses to pay one of those, who had it by inoculation in Newgate, who was sent to Hertford,

where the disease in the natural way was epidemical and very mortal, and where this person nursed and lay in bed with one, who had it, without receiving any new infection.

To make a further trial, the late queen Caroline procured half a dozen of the charity-children belonging to St. James's parish, who were inoculated, and all of them, except one (who had had the small-pox before, tho' she pretended not, for the sake of the reward) went thro' it with the symptoms of a favourable kind of that distemper.

Upon these trials, and several other in private families, the late queen, then princess of Wales, (who with the king always took most extraordinary, exemplary, prudent and wise care of the health and education of their children) sent for me to ask my opinion of the inoculation of the princesses. I told her royal highness, that by what appeared in the several essays, it seemed to be a method to secure people from the great dangers attending that distemper in the natural way. That the preparations by diet, and necessary precautions taken, made that practice very desirable; but that not being certain of the consequences, which might happen, I would not persuade nor advise the making trials upon patients of such importance to the public. The princess then asked me, if I would dissuade her from it: to which I made answer, that I would not, in a matter so likely to be of such advantage. Her reply was, that she was then resolved it should be done, and ordered me to go to the late king George the first, who had commanded me to wait on him upon that occasion. I told his majesty my opinion, that it was impossible

to be certain but that raising such a commotion in the blood, there might happen dangerous accidents not foreseen : To which he replied, that such might and had happened to persons, who had lost their lives by bleeding in a pleurisy, and taking physic in any distemper, let never so much care be taken. I told his majesty I thought this to be the same case, and the matter was concluded upon, and succeeded as usual, without any danger during the operation, or the least ill symptom or disorder since.

I have been consulted with upon the like occasion by many, and have been of opinion, that since it is reckoned, that scarce one in a thousand misses having it some time in their life, the sooner it is given them the better, notwithstanding the heat of summer, or cold of winter ; the danger being greater from falling into the distemper naturally, than from the heat or cold of either.

What I have observed, which I think material, is not to inoculate such, as have any breakings out on their faces, soon after the measles, or any other occasion, whereby the small-pox were likely to be invited, and come in the face in greater number, and so make the distemper more dangerous. Bleeding in plethora's, or gentle clearing of the stomach and intestines, are necessary ; and abstinence from any thing heating, about a week before : and nothing else needful by way of preparation ; and very little physic during the course of it, unless accidents happen.

The operation is performed by making a very slight shallow incision in the skin of the arms about an inch long ; but great care should be had in making the

incision, not to go thro' the skin ; for in that case I have seen it attended with very troublesome consequences afterwards. After the incisions are made, a doffil dipped in the ripe matter of a favourable kind of small-pox, produced naturally, or by inoculation, is put into the wound, covered by a diapalma plaister for twenty-four hours, and then removed, &c. I have known in scarcity of good matter in London, that it has been brought from Seven-oaks in Kent, and applied with good success.

Of above two hundred, that I have advised before the operation, and looked after during it and its consequences, but one has miscarried, a son of the duke of Bridgewater, (in whose family this distemper had been fatal) where the eruption of the small-pox was desperate, notwithstanding it was perfectly safe in his sister, who had undergone the same preparations, and was inoculated the same day, and with the same matter used for her brother.

Upon the whole it is wonderful, that this operation, which seems so plainly for the public good, should, through dread of other distempers being inculcated with it, and other unreasonable prejudices, be stopped from procuring it.

One thing I have observed, that though the persons inoculated were advanced in years, it was equally successful as in younger persons.

LXXII. *Extract of a Letter from Dr. John Stevenfon, Physician at Edinburgh, to John Pringle, M. D. F. R. S. dated Edinburgh, 17 Feb. 1756, with an Account of an extraordinary Agitation of the Water in a small Lake at Closeburn, in the Shire of Dumfries; by Sir Thomas Kilpatrick, of Closeburn, Bart.*

Read Feb. 26, 1756. **T**HE inclosed is from Sir Thomas Kilpatrick, a gentleman of undoubted good sense and veracity. The lake I have seen long ago, but cannot be precise as to its dimensions, which I guess may be a quarter of a mile long. The phenomenon happened on the first of this month February, which was here the finest, clear, calm day we have had this winter. Till now I doubted of the accounts you believed, of agitations in ponds; now I do not, for not only this small lake, but some ponds near, it were moved.

By a letter some days after, there is mention made of two returns of these commotions since the former, but in a moderate degree in comparison with the others.

Sir Thomas Kilpatrick's Letter.

Closeburne, 4 Feb. 1756.

ABout a quarter before nine on Sunday morning, we were alarmed with an unusual motion in the waters of Closeburn-loch. The first thing, that appeared to me in this wonderful scene, was a strong convulsion and agitation of the waters from the west side of the loch towards the middle, where they tossed and wheeled about in a strange manner. From thence proceeded two large currents formed like rivers, which run with swiftness and rapidity beyond all description, quite contrary ways, one from the middle to the south-east, and the other to the north-east points of the loch. There they were stopt short, as the banks are pretty high, and obliged to turn, which occasioned a prodigious tumbling and agitation at both ends of this body of water. There was likewise a current, which rose sometimes considerably above the surface near the west side, that I frequently observed running with great velocity an hundred yards to the southward, and returning in a moment with as great velocity the other way. What I noticed in the next place, was the tossing of the waters in the ponds, which were more or less moved as the agitations of the loch came nearer this side, or kept a greater distance from it. But as it is beyond my capacity to give a particular description of all that happened upon this occasion, I shall conclude with telling you, that the agitations and currents above-mentioned continued, without intermission, for at least three hours and an half, or four hours, when they

they began to abate a little in their violence, though they were not quite over at fun-set. I had almost forgot to tell you, that this strange phænomenon was renewed on Monday morning a little before nine, and lasted for an hour and an half; but the motion of the water was not near so violent as the day before. What is very remarkable, there was not the least breath or gale of wind on Sunday till one o'clock: a circumstance, which helped us not a little in our observations.

LXXIII. *Accounts of the Irregularities of the Tides at Chatham, Sheerness, Woolwich and Deptford, in Feb. 1756. Communicated by the Rt. Hon. George Lord Anson, F. R. S.*

L E T T E R I.

S I R,

Read Feb. 26, 1756. **T**HIS acknowledges the receipt of your letter of the 21st instant; in return to which I have sent you, for my lord Anson's information, an account of the irregularity of the tides, having taken particular notice of them by the *Lys*, a French ship, having broke from her moorings three times in that week. The first time was on Thursday the twelfth instant, at about ten in the morning, it being then about high water, or rather ebb; so that we could not get her off that tide, but attended and hove her off the next, at about nine at night, which was sooner than we expected

pected by an hour and half. We then put her to another mooring, and about half past eleven the same night, she broke from them also, and came on shore near the dock, it being then a small matter ebb, so that we could not get her off that tide, but attended her the next, till half past eleven on Friday morning in order to do it, (it then being about the time of high water) but could not, the tide being not so high by five or six feet as it was the tide before, though it should have been higher, as they were encreasing. And I further took notice at the same time, that the tide was at a stand several minutes, and then flowed again near a foot in height before it ebb'd, and the next tide, at half past nine at night, we got the ship off, though we did not expect she would have floated till near twelve: and again in transporting her up to her moorings, we observed, that there was little or no tide ran from ten to twelve, which was about the time of high water; which we greatly wondered at, as it was quite calm. All which irregularities I imagine to be owing to the wind, having had very hard gales for most part of that week; but since have observed nothing in them particular. Pray my humble duty to his lordship. I am with my best respects,

S I R,

Chatham-yard, Feb. 23, Your most obedient
1756.

humble servant,

To Philip Stephens, Esq;

Michael Godden.

L E T T E R

L E T T E R. II.

S I R,

Read Feb. 26, 1756. **I**N obedience to my lord Anson's commands communicated to me by your letter of the twenty-first, I herewith transmit you the best accounts I could collect, together with my own observations on the tides at this place from the ninth to the nineteenth instant, and beg leave to observe to you, that the day tide on the thirteenth instant was very remarkable; for it ebb'd no more than two feet and a half for four hours after high water, when it was observed to flow again for a few minutes; then ebb'd again, but so little, that at low water, we had seven feet water at the stern of the dock, which is five feet more than was ever known to be. It blew very hard in the morning on the flood, with the wind to the southward of the west, and on the ebb in the afternoon the wind abated and veered to the north-west, to which I then, in part, attributed this phænomenon, as a northerly wind forces water into this river, and always makes high tides, and a southerly wind the contrary.

Sheerness, Feb. 23,
1756.

Your most obedient and
most humble servant,

Michael Monarty.

To Philip Stephens, Esq;

Year, Month and Day.	Time of High-Water.	Depth of Water.		Wind.
		Fect.	Inches.	
1756,				
Feb. 9,	$\frac{1}{4}$ past 6 in the morn.	12,	8.	S. by W.
Ditto.	$\frac{3}{4}$ past 6 at night.	9,	10.	S.S.W.
10th,	$\frac{1}{2}$ past 7 in the morn.	13,	6.	Calm.
11th,	$\frac{1}{4}$ past 9 at night.	13,	6.	S. W.
12th,	10 at night.	15,	5.	W.S.W.
13th,	$\frac{3}{4}$ past 10 in the morn.	11,	0.	Ditto.
Ditto.	$\frac{1}{4}$ past 11 at night.	15,	11.	W.N.W.
14th,	$\frac{1}{2}$ past 11 in the morn.	12,	6.	W.S.W.
Ditto.	12 at night.	15,	0.	W.
15th,	5 min. past 12 in the morn.	17,	0.	W. by N.
16th,	$\frac{1}{4}$ past 12 in the morn.	11,	8.	S.W.
Ditto.	$\frac{3}{4}$ past 12 P. M.	18,	0.	W.N.W.
17th,	$\frac{1}{2}$ past 1 in the morn.	16,	0.	Ditto.
18th,	$\frac{1}{4}$ past 1 in the morn.	17,	0.	E.S.E.
19th,	$\frac{3}{4}$ past 2 in the morn.	17,	6.	N.W.

LETTER III.

S I R, Woolwich Yard, 25 Feb, 1756.

Read Feb. 26, 1756. **I** Am favoured with yours of the 21st instant, signifying my lord Anton's commands, to send you such observations, as I have made myself, or the best accounts I may be able to collect from others, of the tides for the last week, and even for some days this week, being very irregular and unusual. And in obedience to your said letter, I have collected the best accounts I can, and with some observations I made myself, have sent them

them inclosed for his lordship's informat'on: and am,
with due respects,

S I R,

Your most obedient servant,

Walter Taylor.

To Philip Stephens, Esq;

1756
Feb.

Woolwich-Yard, 25 Feb. 1756.

Monday 9, wind S. fresh gale and cloudy, tides very irregular.

Tuesday 10, S.W. fresh breeze with rain, ditto

Wednesday 11. S.W. fresh breeze and frosty, ditto.

Thursday 12, S.W. blue hard and cloudy; the night tide flowed about two feet ten inches higher than the morning tide.

Friday 13. W.N.W. blew hard and cloudy; the night tide flowed about three feet higher than the morning-tide.

Saturday 14, S.W. fresh gale and cloudy; tides more regular.

Sunday 15, W. fresh breeze and cloudy, ditto.

Monday 16, As it drew near the time for launching his majesty's ship Royal-George at this yard, I took more notice, and observed, that this day we had the wind at W. and W. by N. a strong gale, and the ebb-tide drained well out. On the flood, we had a good spring-tide.

Tuesday 17, The wind flew to W.S.W. a strong gale, which drained the ebb-tide more confide-

rably out than yesterday; and on the flood we had a good spring-tide, much the same water as yesterday.

Wednesday 18. About two o'clock this morning, the wind was at E. a fresh breeze and hazy; (but I believe in the northern seas it might then blow a strong gale at N). As the day came on the gale increased, and blew hard at N.E. with snow. The flood this day I observed came in much sooner than usual, and seemed to flow gradually at first, but between one and two p. m. the tide flowed several feet, as on a sudden, and continued flowing till three quarters past three, being some time longer than it was expected it would, and we had a high tide.

Thursday 19. The wind was W.N.W. a fresh gale and frost. And this day's flood did not hold so long by a quarter of an hour as yesterday's, and not so much water by several feet. The wind being to the westward, and a frost, greatly check'd the tide.

Since which, the tides have been very regular.

Walter Taylor.

LETTER IV.

Deptford-yard, 24 Feb. 1756.

*An Account of the Moon's Age, Time of High-Water
at the Double-Dock-Gates, Observations of the
Wind and Weather.*

Read 26 Feb. 1756.

Day of the Month.	Moon's Age.	Time of High Water.	Height of Water at the Double- Dock-Gates.	Wind.	Observations of the Weather.
1756	Days.	Hrs. Mi.	Feet Inches.		
Feb. 2	12	10 3	14 6	W.	Cloudy with hard gales.
13	13	11 0	14 0	S.W.	Fair.
14	14	12 0	15 6	S.W.	Ditto.
15	15	1 0	13 0	S.W.	Cloudy with rain.
	Full				
16	16	2 0	15 6	W. by N.	Fresh gales.
17	17	3 0	16 0	N.E.	Ditto.
18	18	3 20	16 6	N.E.	Cloudy.
19	19	4 0	15 3	N.E.	Fair.
20	20	4 30	15 6	S.W.	Ditto.
21	21	5 0	14 8	S.W.	Ditto.
22	22	6 15	14 4	S.W.	Ditto.
23	23	7 30	14 2	N.W.	Little wind, foggy

LXXIV. *Accounts of the Irregularities of the Tides in the River Thames, on the 12th and 13th of February, 1756. Communicated by Robert Dingley, Esq; F. R. S.*

S I R,

Read Mar. 4,
1756.

According to your desire, I shall set down in writing the variations, that happened in the tides the 12th and 13th of last month, according to my own observation, and from others of whom I enquired; *viz.*

Thursday Feb. 12, the time of high-water at London-bridge that day was about half after eleven, and flowed no higher at Westminster-bridge at high-water than the low-water is, at times when extraordinary land floods are out, and the wind to the Northward. The wind during the whole flood was at W.S.W. and blew hard.

On the 13th it was high-water at London-bridge rather before one o' clock, and continued ebbing till four, when the water was gone from the Custom-house-wharfs, where I was with a merchant's clerk, consulting how to get some goods aboard my craft, in order to send them down to the ship, my servant having neglected to put my boat under the crane before the water had left the wharf. During this parley, the water most unexpectedly flowed again directly; and without that extra phænomenon setting my boats afloat, it would have been impossible to have shipped the goods that day, being seven large bales and twenty thousand ounces of silver.

During

During the time of the water flowing, the strength of the current going down was greatly abated, almost to a slack ; the water below the sterlings was almost on a level with that above ; by which I conjecture, that the water flowed near three feet perpendicular. My boat of nine tuns burden being loaded, and drawing near two feet water, being put off into the stream, I went down to the Hermitage, where another of my servants was loading a lighter of hemp, and observed as I went along, that the water began to ebb from the shore. Having stayed there about half an hour, to give the necessary directions to my servants, I went to take a walk ; for which I am extremely sorry, as I missed observing with due attention this extraordinary variation. All my servants agree, that by their observations, though not over exact, when the water had only ebbed about two feet, it flowed again to the same height as before.

One John Hare, a waterman, told me, that as he was going in his boat to Woolwich, to his great surprise he met the flood in Greenwich-reach, and afterwards to Bugby's-hole, and got to Woolwich a considerable time before low water ; which intirely agrees with what my servants and other watermen who were at work remarked, that it flowed twice in the time of ebb, as it ought to have done, had it been regular ; and had it been regular, it would have ebb'd till near nine that evening ; instead of which the real flood came about a quarter before seven, and continued flowing till one after midnight, without any apparent current, till twelve, which prevented my servants, and partner with them, bringing

ing the craft upwards to their destined places, and as soon as the tide pinched, the ebb came down at once.

I apprehend, that as the floods were remarkably weak for several days, and the water of a yellow colour, great rains had fallen in the West-country, tho' we had none here sufficient to produce such effects. And what is more extraordinary to me, is, why the highwater should be so remarkably low, if there had been land floods, especially on the 13th and 14th, when the wind was from W.N.W. to N.W. which generally brings in the flood sooner, and makes it flow higher; tho' it partly accounts for the evening tide. On the 13th no observation was or could be made above London-bridge on the 13th, by reason the water never flowed to a level with the water above. I am,

S I R,

Your most obedient servant

Copy of a Letter on the same subject, from Captain William Mitchel. Dated Hermitage Five o'clock, 12 Feb. 1756.

S I R,

THE difference between the last tide and a common neap tide was four feet; and betwixt it and the common stream about nine feet perpendicular; betwixt it and a very high tide in last November, above ten feet. The carpenters and labourers in the dock-yard, from whom I had this
in

intelligence, say, they never knew, in forty to forty-five years observation to low a tide, by full two feet; you may depend on the winds having 'been stronger to the S.W. below than here.

William Mitchell.

To the Rt. Hon. George, Earl of Macclesfield, President of the Royal Society.

My Lord,

Read Mar. 11, 1756. **I**N obedience to your lordship's commands, I have informed myself more particularly what Hare the waterman related, concerning the late irregularity of the tide, in the paper I had the honour to lay before the Society last Thursday, which is as follows.

That Hare going down the river the 13th past with the current, he met an unexpected slack in Greenwich-reach. Soon after, as he proceeded, the current regained its force; but about three miles lower, in a reach called Bugby's-hole, he met again another slow or slack water; and before he got to Woolwich, which is about three miles lower, the current regained its force, and continued running down some time after; whereas, according to the tides, had they been regular, it ought to have been low water before the time he got to Woolwich.

By enquiring more circumstantially relating to this phenomenon, that as the wind then prevailed pretty strong at W.N.W. and N.W. in all probability the wind might make a sudden shift, which caused these sudden impulses or eddies: but this I submit to your

Lordship's superior judgment, being with all possible respect,

My Lord,

Your Lordship's most obedient

humble servant,

London, Mar. 8,
1756.

Robert Dingley.

LXXV. *Thoughts on the Reverend Dr. Hales's new Method of Distillation by the united Force of Air and Fire. By William Brownrigg, M. D. F. R. S.*

To the Rev. Dr. Hales, D. D. F. R. S.

Dear Sir,

Whitehaven, Dec. 3, 1755.

Read Feb. 26, 1756. **I** Duely received the favour of your letter, written so long ago as the latter end of May last; containing an account of your important discovery of raising large quantities of water by the united operation of air and fire, in your new method of distillation. In obedience to your commands, on the receipt of your letter, I immediately set about considering to what uses your ingenious invention might be applied, besides the great one of supplying navigators with fresh water; and shortly after wrote out the inclosed paper relating to the improvement

provement of the fire-engine. This I presented, with your letter, to my worthy friend and relation, Mr. Carlisle Spedding, then superintendent of our coal-mines, who was an excellent mechanic, and had then the charge of five fire-engines, several of which had been under his care and management from the time, that those machines were first brought into use, and had himself made considerable improvements in them. He was pleased to express his approbation of what I had written, and was of opinion, that future improvements of the fire-engine must depend chiefly on the right solution of those two propositions, viz.

“ To increase the quantity of steam from a given
 “ vessel and a given heat, by means of mechanical
 “ agitation; and, to augment the elastic force of a
 “ given quantity of steam by means of fire:” and wished, that proper experiments could be made in these matters, which he thought would prove too expensive for most private people. His untimely and much lamented death put an end to these enquiries; and a variety of necessary avocations prevented me from sooner communicating to you the result of them. They are chiefly conjectures, which experience must ripen into use. I dare not assert, that the theory is altogether faultless; therefore very unfit to appear before the public. The honour you did me of communicating my rough plan of a history of damps to the Royal Society, I esteem a particular mark of your kindness and affection; altho’ that plan was only intended for your own private use, and would not have appeared before that respectable body, (especially in its present form) had it not

been for your partial regard to it. I should be sorry to see any part of it published in the *Transactions*, especially as I long ago laid aside the design, which from the answer I received to the letter, of which I sent you a copy, I did not then think myself at liberty to prosecute, and do not think, that I shall again find leisure to resume it. I have long been of opinion, that, in order to attain a perfect knowledge of the nature of the air, we must trace it from its hidden sources in the bowels of the earth; and must own myself ambitious of treading in your steps, and of prosecuting your enquiries concerning the nature of its vivifying spirit;

*Non ita certandi cupidus, quam propter amorem,
Quod te imitari avelo.*

With this view, I had collected, under proper heads, all that I found in authors relating to that subject; and had prepared an apparatus, and also made some experiments to discover what alterations were produced in various kinds of air by stagnation; and what effects the different kinds of air, as well simple as compounded, had on animals included in them; and by these and such-like experiments, I might perhaps entertain too sanguine hopes of making some useful discoveries concerning the nature, and even the component ingredients, of the vivifying aerial spirit.

An ingenious friend, on reading the account of your method of distillation, was pleased to suggest, that the quantity of steam might perhaps be increased by heating the air, that is forced through the water contained in the still. This might be done conveniently enough, by passing an iron pipe, that goes
from

from the ventilator through the furnace, which boils the water in the body of the still.

Dear Sir,

Your most affectionate and

most obedient servant,

W. Brownrigg.

Thoughts on the Rev Dr. Hales's new Method of Distillation by the united Force of Air and Fire.

Read Feb. 26, 1756. **I**N the process of distilling sea water, as described by the reverend Dr. Hales, the great increase of vapour raised by his method, above what is raised by the common method of distillation, may be attributed, chiefly, to the violent agitation of the water contained in the body of the still, by the motion of the air continually pressed through it. Although the air, by attracting the watry particles, may also contribute to produce this effect. It is however certain, that a simple mechanical agitation of warm water will greatly promote its evaporation, by increasing its surface, from whence the vapours arise, and by putting its heated particles in a brisker motion, and exciting between them actions and reactions, and so disposing them to fly off in elastic vapours.

Of this we have instances in warm water, when stirred about in vessels, or poured out of one vessel into another; from which the vapours visibly arise

in larger quantities than from the same water, when it is not moved by such mechanical agitation.

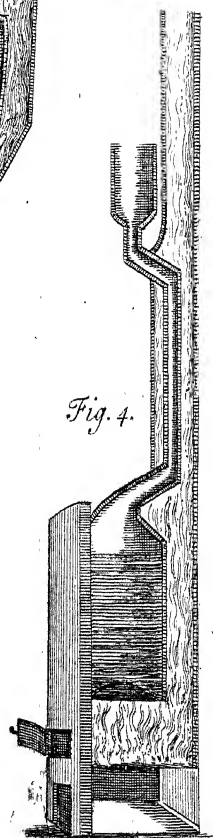
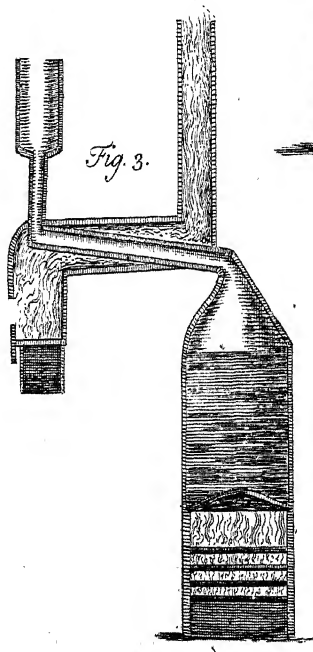
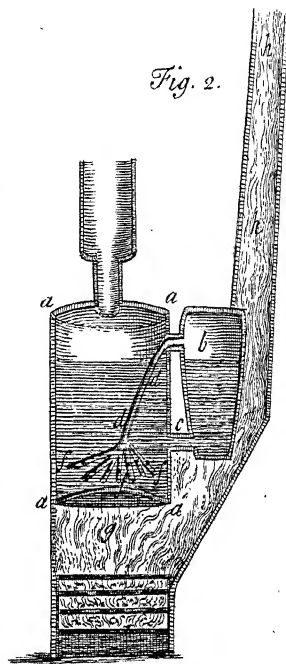
This excellent invention of Dr. Hales may probably be applied to other purposes besides that, which he had principally in view, viz. the distilling of seawater with greater ease and expedition, with less fuel, and in smaller vessels, than has hitherto been practised, for the benefit of navigators.

It might be of singular use, if it could be applied in the fire-engine. The great expence of large boilers in the construction of that machine, and the vast consumption of fuel in the working of it, render its uses much less extensive than they would be, could those expences be contracted. Various contrivances have with this view been tried ; and it is to be wished, that others could be discovered, that would more effectually answer the end proposed.

But air cannot be applied, in this engine, to increase the quantity of the elastic steam, since it would pass with the steam from the boiler into the cylinder, and prevent a vacuum from being there produced, and hinder the piston from moving therein.

A mechanical agitation of the water in the boiler of the fire-engine may however be produced by other means so as that a larger quantity of steam may probably be raised than can be effected in engines as commonly now constructed ; by which means the expences of constructing and working those useful machines may perhaps be greatly lessened.

If, for example, the boiling water, instead of being agitated by air, as in Dr. Hales's method, was briskly stirred about by a wheel placed in the boiler of the fire-engine ; it is probable, that by this means
the



the quantity of elastic vapour raised might be considerably encreased, and less fuel and a less boiler might then serve the purpose. The wheel might be turned round by the water drawn up by the engine; or might receive its motion from the beam of the engine by means of a crank; or a labourer might be employed in turning it round with the hand. See TAB. XVI. Fig. 1.

But the desired effect might, in all probability, be better produced by means of elastic steam driven briskly through the boiling water. The steam of water, as an elastic fluid, possesses many of the properties of common air.

Like air, when driven briskly from the æolipile, it is observed to blow up fire; and when forcibly driven through water, will doubtless produce the the same agitation therein, as is done by common air in Dr. Hales's experiment; and may probably have the like effect with air, in elevating a larger quantity of elastic vapours.

In order to excite an agitation in the boiling water of a fire-engine. by means of elastic steam, the following simple and easy method may be tried.

Fig. II.

aaaa. The boiler of the fire-engine.

b. An æolipile, or smaller boiler, annexed to the larger, receiving boiling water from it by the pipe (*c*), and continually emptying strongly elastic steam into it, by the alembic and tube (*dd*); which tube towards the bottom of the boiler is divided into many smaller tubes (*fff*).

perforated with holes, thro' which the steam passing produces a violent agitation in the water contained in the large boiler, and so increases the quantity of elastic steam.

The flame of the fire (*g*) ascending up the chimney (*bb*) may in its passage heat the water in the æolipole (*b*).

N.B. Either, or both, of the above contrivances may be applied to the boiler of an alembic, in the distillation of sea water for the use of navigators, in imitation of the method invented by the rev. Dr. Hales.

Further Experiments relating to the Fire-engine, by lessening the expences of constructing and working it.

Theory.

It is found by experiments, that, *cæt. paribus*, the elasticity, or expansive force of common air, is in proportion to its density. And also that *cæt. par.* its elasticity is proportional to its degree of heat. And therefore, that its elasticity is proportional to its degree of heat,

The same probably holds true in other elastic fluids; and particularly in the steam of water; since, like all other bodies, it is capable of rarefaction (at least to a certain degree) by heat; and its elasticity, or expansive force must augment in proportion to the degree of heat which it receives.

Explanatory Example.

Let us suppose, for example, that the heat of the steam in the boiler of a fire-engine is now 300 degrees of Fahrenheit's thermometer; it is evident, that if the same steam could, by any art, be heated to 600 degrees, its expansive force would be greatly increased; so that a much smaller quantity of steam thus heated would overcome the pressure of the air, and elevate the piston of the fire-engine, than is now applied for that purpose. And this smaller quantity of steam might be raised in smaller vessels, and with less fuel than is now used in the working that engine.

Practical Observations.

The heat of the steam now applied must be nearly the same with the heat of the water, from which it is raised. The heat of boiling water, in open vessels, is found, at a medium, about 212 degrees in Fahrenheit's thermometer; in close vessels, it is often considerably greater; but, in the boiler of the fire engine, can scarce exceed 300 degrees; it is certain, that it never approaches near to the heat of melted lead, since the sides of the boilers are often made of that metal. And it is observed, that the fire, when it touches the sides of the leaden boiler, where it is only filled with steam, does not melt the lead; the steam having the same effect with water in keeping the lead cool, to which the fire is applied.

From the following instance it nevertheless seems probable, that the steam of water may be brought to so great a heat, as to melt lead, to which it is applied. The pipe, which supplied the boiler of a fire-

engine with water, was by some accident stopped; and the water in the boiler was so exhausted, that the crown of the boiler, (or the middle part of the iron bottom, which is most elevated) became quite dry and was heated red hot. And altho' there was only so small a quantity of water remaining in the boiler, the engine ceased not to work; but, on the contrary, was observed to move with unusual briskness; until at length, the strongly heated, and extremely rarified steam melted the pewter, where-with the joints of the top of the boiler (which was of copper) were soldered, and burst through them with great impetuosity.

Conclusion from the foregoing Experiments and Observations.

The foregoing experiments seem to prove, that the steam of water is capable of being heated and rarified to a much greater degree than the steam is heated, which is now applied in the fire-engine; and that the expansive force of steam is greatly increased by heat, and consequently, that a much smaller quantity of steam, most strongly heated and rarified, will work an engine, than is now applied of cooler steam. Which smaller quantity of steam may be raised in smaller vessels, and with smaller fires, than are now used in working those engines.

Practice.

The steam of water may probably be heated and rarified to a very great degree, for the use of the fire-engine, by the following method.

To the head of the boiler let a pipe of cast iron be fitted nearly in an horizontal position, as in Fig. 3. but inclining a little towards the boiler; and let this pipe be continually kept red hot, by the fire of an air-furnace, through which it may pass; and thro' this pipe let the watry steam be conducted to the cylinder of the fire-engine.

Or the steam may be rarified by making it pass from the boiler to the cylinder, through an iron pipe or cylinder fixed in the flue of the furnace, of which contrivance a rude sketch is given in Fig. 4.

N.B. The evaporation from the boiler may perhaps be considerably quickened by the rarefaction of the steam.

It may not be improper to make trial of one or both of the above methods of heating the steam, or of other methods, that are more commodious; and also to add to the boiler the above recommended apparatus for raising a larger quantity of steam, by means of mechanical agitation. The fire-engine, as first invented by Savery, was rude and imperfect, and since his time many ingenious men have been continually making improvements therein; neither doth it yet seem to have attained to its greatest degree of perfection. There is even reason to hope that, by one or both of the methods here pointed out, viz. (either by encreasing the quantity of steam, or by augmenting its force) it may be brought to work with much smaller boilers, and with a very moderate expence of fuel; and under such circumstances it might be applied to a vast variety of purposes, and would become of much greater use to mankind.

LXXVI. *Extract of a Letter to the Rev. Dr. Hales, F. R. S. from Governor Belcher's Lady; dated Elizabeth-town, New-Jersey, Oct. 22, 1755; concerning an extraordinary Motion in the Waters in the Lake Ontario in North-America.*

Read Feb. 19, 1756. **I** Take this opportunity to acquaint you with a strange phenomenon of the lake Ontario, where general Shirley has posted himself with two thousand men, at fort Oswego. A person lately come from the camp reports, that about a fortnight since, that lake rose and fell five feet and half, three several times, in the space of half an hour. I wish I could send you a more particular account of it.

LXXVII. *An Extract of a Letter from Mons. Grovestins, Master of the Horse to his R. H. the Prince of Orange, Lieutenant-General, Commandant of the Forces, concerning an Earthquake felt by himself at the Hague, on Wednesday the 18th of Feb. 1756. Translated from the French, and communicated by the Rev. William Parker, D. D. F. R. S.*

Read Mar. 4, 1756. **O**N Wednesday morning, twelve minutes after eight, we had a shock of an earthquake. I was then reading: my chair received

received five successive shakes. The sconces in the chamber were in like manner moved. Ten or twelve minutes after, I perceived a second shock, but not so strong as the former. The water, which I looked upon, remained quiet. The air was calm. There was a little fog. The wind was S.W. Immediately after the earthquake, it turned N.E. The news from Maestricht and Utrecht brings word, that they have likewise felt it there.

LXXVIII. *An Account of an Earthquake felt in Holland, Feb. 18. 1756; in a Letter from Monsieur Allemand, Professor of Natural Philosophy at Leyden, and F.R.S. to Mr. Trembley, F.R.S. Dated at Leyden, Feb. 27, 1756. Translated from the French.*

Read Mar. 4. 1756. **T**HERE was felt here a violent shock of an earthquake on the 18th of this month of February, three or four minutes before eight in the morning. It was not perceived in my house, nor in many others: but those persons, who were in bed, or not in motion, felt it. Two of the bells in this city struck each one stroke. A considerable number of people were affected with a kind of vertigo, without being sensible of the earthquake. It was felt throughout the whole territories of this republic. It occasioned much confusion at Amsterdam in some churches, where service was performing. Many persons quitted their houses at Maestricht; but only for a short time. Since the
first

first shock on the 18th, at eight in the morning, which threw down some chimnies, several others have been felt in that city.

LXXIX. *An Account of the Earthquakes felt at Bruffels; in a Letter from John Pringle, M.D. F.R.S. to Thomas Birch, D.D. F.R.S.*

Read Mar. 11, 1756. **B**Y a letter, which I received a few days ago, from Dr. Brady, physician to the court at Bruffels, I find they have felt in that city this winter three several shocks of an earthquake. The first was on the 26th of December; the second on the day following; and the third on the 18th of February, being the same day it was said to be felt on our coast between Margate and Dover; but the hour is not mentioned. All these shocks, he says, greatly alarmed the inhabitants; but were otherwise attended with no bad consequences.

Dr. Brady adds, that he was told by a gentleman from Liege, that the men, who were at work in the coal-pits, and particularly in some of the deepest, near that city, had assured him, that they heard the rumbling noise preceding the shock, as over their heads; whilst those, who were above ground, heard the same kind of noise as under their feet.

I have inclosed a letter, which, if you think proper, may be laid before the Society, as containing
an

an authentic account of the sinking in of the small river near Pontypool in Wales. It is written by an excise-officer in that district, and was put into my hand by Mr. Windham Bowyer, one of the commissioners of that board. I am,

S I R,

Pall-mall, Mar. 11.
1756.

Your most obedient

humble servant,

John Pringle.

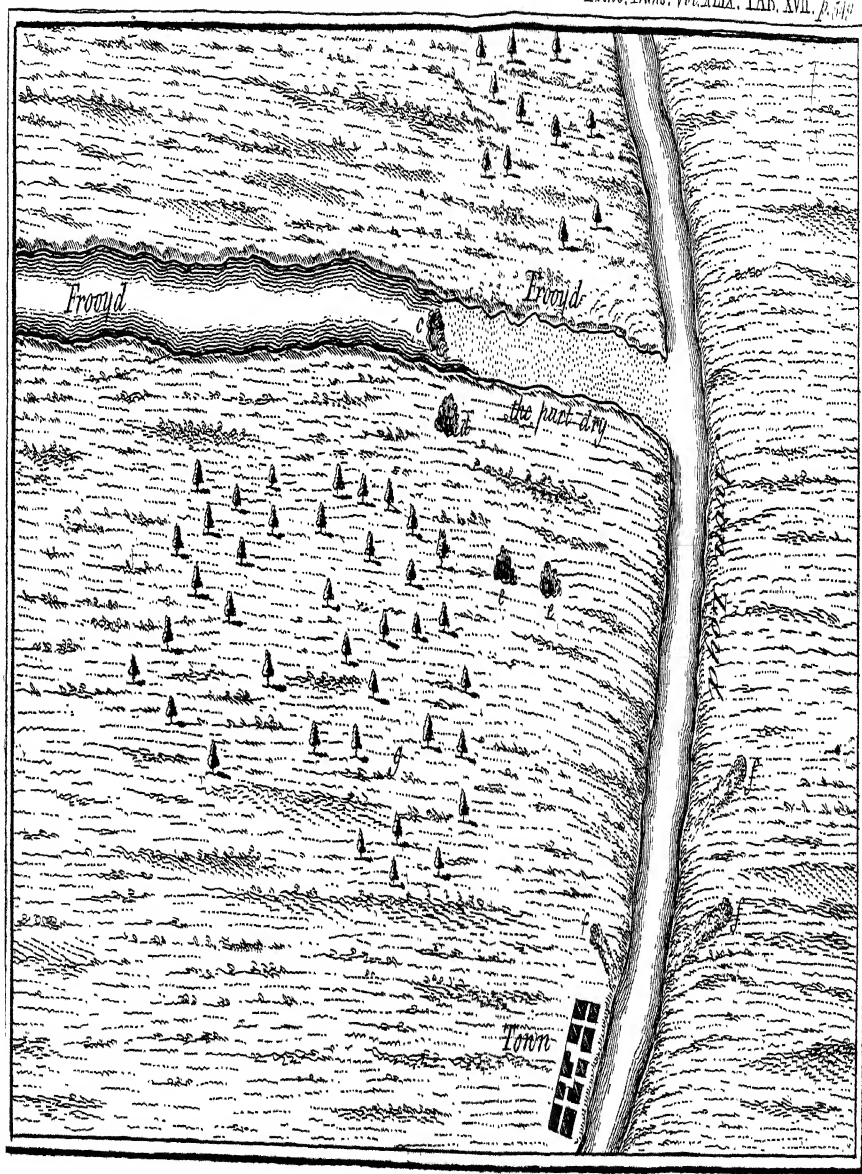
LXXX. An Account of the Sinking of a River near Pontypool in Monmouthshire; in a Letter from Mr. Edward Matthews, to the Commissioners of the Excise.

Honourable Sirs,

Read Mar. 12, 1756. **I**N obedience to your honours orders of the 14th instant, relating to the sinking of a river near Pontypool; from my own observation last Friday (the first time I saw it) and that of the neighbouring inhabitants, as under, is the best account I am able to give of it. The first day of January last, a poor woman living near its mouth sent her daughter for water (a great flood appearing in the river just before) who returned in surprize with the account, that it was dry.

The

The River is called by the name of Frooyd, running between two steep hills, or woods, but not very high : it proceeds from water from the adjacent mountains, and seems penn'd up and let out precipitately, to cleanse the iron ore lying near the surface on the sides of these mountains, which greatly discolours the water, which at those times, and after heavy rains, is so rapid and violent, as to carry down prodigious quantities of large stones into another river called Avon Looyd. On Friday last I walked up the Frooyd on the bottom of the river, it being quite dry, up to the chafin, that now receives the water : it is about twenty feet wide ; and when its banks are full, about eight or ten feet deep ; but now filled up to fifteen feet with stones carried in by the water. There's a lime-stone rock near the surface, about two feet thick, lying in large beds two or three feet square, more or less, in some places, joined close in others ; the joints not so close between these beds filled up with small gravel, which was by the rapidity of the stream supposed to be washed out of those joints over a cavity under the said lime-stone rock, and the great weight of water at that time falling from a small precipice just above, forced in one of these beds of stone. The sides of the pit under the lime-stone rock appear to be composed of different materials, as gravel and earth, but firm and perpendicular. On one side this river near this hole, are three pits sunk at the same time, the one within ten yards, of which there was no appearance before ; the other two at about thirty yards up the side of the hill (which have been observed, for many years, though no body knew the cause of them) are now sunk some yards



yards deeper, and some trees and shrubs, that were round the edge of these pits, with the ground on which they grew, are sunk down near the bottom. I believe these pits at top may be about twelve yards diameter growing gradually narrower to a center, in shape of a funnel or tun-dish. Under, it is supposed, is this cavity, through which the river now runs, extending itself in one place under the river Avon-Looyd, at about a mile distance, where it broke out a few days after, in several places, on the opposite side thereof, where were three small springs. The reason for this conjecture is, these springs were observed to be always clear till a few days after the sinking of this rock, but now continue to put forth large quantities of this water, which varies in colour agreeable to the water received in at the hole. I am,

Your Honours

Abergavenny, Feb. 22,
1756.

most humble and

obedient servant,

Edward Matthews.

TAB. XVII.

- a. The great chasm, which receives the greatest part of the water.
- b. Gravel washed away in the joint of the rock, through which runs into the cavity a considerable quantity of water, within four foot of the great hole.
- c. A precipice just above the chasm.
- d. A hole sunk in never before observed.

e e. Two pits-observed years ago, now sunk much deeper.

fff. Former clear small springs, where it is supposed the water now vents itself.

g g. Steep rising ground, or woods, on each side Frooyd, declining towards the Looyd.

LXXXI. *An Account of the Agitation of the Waters, on the 1st of November 1756, in Scotland and at Hamburg. Communicated by John Pringle, M. D. F. R. S. in a Letter to the Rev. Tho. Birch, D. D. Secret. R. S.*

S I R,

Read Mar. 18, 1756. **T**HE two inclosed accounts of the agitation of the waters, on the first of November last, I received since the last meeting of the Society. One was transmitted to me by Dr. Simson, professor of medicine in the university of St. Andrews, containing the observation of Mr. Mark M'Callum, master of a Greenland ship, who happened to be that day at the Queen's-Ferry, a sea-port town on the Frith of Forth, about seven miles farther up than Leith. The account is addressed to the rev. Mr. Dalgleish, a friend of Dr. Simson's, and employed by him to procure the best information.

Dr. Simson, in the same letter to me, takes notice of a report, as if the same agitation of the water was likewise

likewise seen at Alloa, another sea-port town about sixteen miles higher on the Frith; but as he had received no certain account of that circumstance, he could not answer for the truth of it. He concludes with saying, that, so far as he could be informed, there was no sensible agitation of the sea any-where on the coast of Fife; though great part of that county lies upon the Frith, and abounds with inhabitants on the coast, who might have made the observation.

The other paper is an extract of a letter from Mr. Reimarus, professor of the oriental languages at Hamburgh, to his son, Mr. Reimarus, at present student of physick in this place. This last gentleman wrote to his father, at my request, in order to have an authentic account of what we read in the publick papers, concerning the motion of the candlesticks in the churches, and the agitation of the waters in and about that city on the first of November last. I am,

S I R,

Pall-mall, 18 Mar.
1756.

Your most obedient

humble servant,

John Pringle.

S I R,

Read Mar. 18,
1756.

ABout ten o'clock of the forenoon, on the first day of November, to the best of my remembrance, being then on the pier at Queen's-ferry, I observed the water to rise

very suddenly, and return again with the same motion, which I judged to be about a foot, or eighteen inches perpendicular, which made the barks and boats then afloat run forwards and backwards on their ropes with great rapidity; and this continued for three or four minutes, it being then calm; but after the second or third rush of water, it always grew less: And this is the nearest calculation I can make.

Mark M'Callum.

Read Mar. 18, 1756. **T**HE following phenomena are well vouched to have happened at Ham-
 bourg, the first of November 1755. In one of the Churches many persons, that were present, observed an agitation of the branched candlesticks hanging from the roof, about one o'clock after noon. In another church, the cover of the baptistery hanging from the roof was also remarked to be agitated: and the like motions are said to have happened in other churches. It is likewise sure, that the water in the canal thro' the town, and in the river Alster, was agitated the same day. It is described first to have formed several gentle whirlpools, from thence to have risen more and more impetuously, throwing about mud brought up from the bottom, and at last to have subsided with a copious white froth. The Elbe is said to have risen in some places still more violently.

LXXXII. *Microscopical Observations : In a Letter from Edward Wright, Esq; to Mr. Peter Collinson, F. R. S. dated at Paris, Decemb. 26, 1755.*

Read Mar. 18, 1756. **I**T appears from Mr. Needham's experiments, and those of Monsr. de Buffon, that animal and vegetable substances infused in boiling water, put into bottles completely filled, and so closely stopped, that no air can enter, and even kept for some time in hot ashes, that in case there should be any latent ova of insects, they may effectually be destroyed; it appears, I say, from the experiments of these gentlemen, that such substances, notwithstanding such precautions, afford microscopical animalcules of various kinds, and that sooner or later, according to the greater or less degree of exaltation in the substances. Hence they conclude, that there is a real productive force in nature, by which these animalcula are formed.

Having read the accounts of these experiments, I was desirous to make some of the same kind, which I accordingly did, in the summer of the year 1752.

Though the greatest part of the animal substances, upon which I made any experiments treated in the manner above-mentioned, yielded, sooner or later, great numbers of microscopical animalcules; yet most of the vegetable substances, whether from the coldness of the season, which was not very favourable that year with us, or for some fault in preparing the infusion, intirely failed, and underwent a fermentation,

tion, without ever giving the smallest marks of any thing endowed with life.

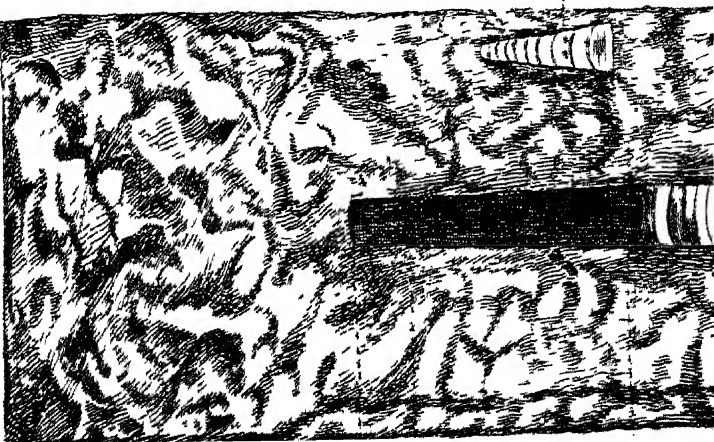
As I had little leisure, my experiments were neither so numerous nor so well managed, as I could have wished; nor did I take notes of the event of any, except that of two, which I made upon millepedes and cantharides, substances much used in medicine, which renders observations upon them so much the more interesting.

May 1st, 1752, at eleven o'clock forenoon, I made an infusion of dried millepedes, or wood-lice, such as are commonly kept in our apothecaries shops. These I put unbruised into a small phial, so as to make it half full; then poured upon them as much boiling water as filled it neck and all, stopped it with a well masticated cork, and put it into a pocket, where it was kept in a mild degree of warmth. I let it remain till ten o'clock the same evening, when I examined a drop of the infusion with the highest magnifier of a very good microscope made by Mr. Clarke of Edinburgh. I found the whole swarming with oblong, slender, flattish pellucid animalcules, pretty nearly of the same breadth throughout the whole length of their bodies, and without any appearance of a tail (*see* TAB. XXII. Fig. I.) all evidently of the same kind, though not all of the same length and dimensions, extremely vivid, and, as appeared pretty evident to me, spontaneous in their motions, which they performed in all directions in an undulatory, vermicular way.

Upon observing the speedy appearance of these animalcules, I wished to know, in how short a time they might be produced; for which purpose,

J. Wignall delin.

J. Mynster sculp.



F

Fig. 3

d. e

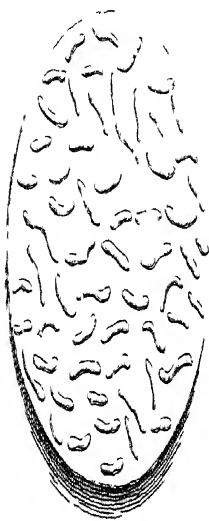


Fig. 1.

Fig. 2.

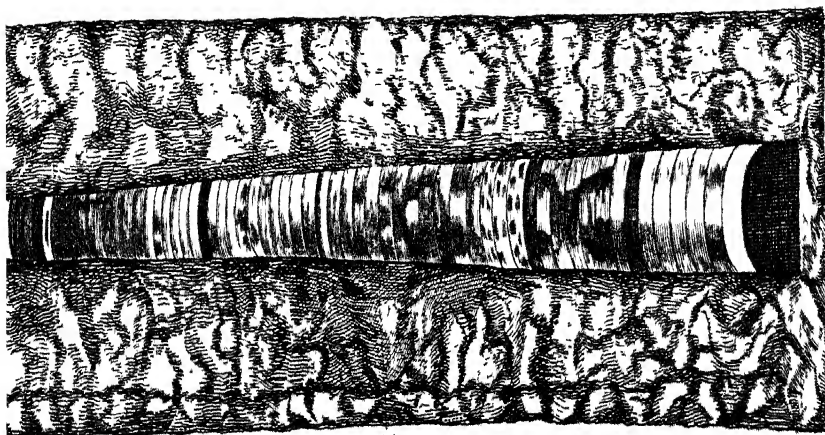


Fig. 3.

A

May 3d, I made juſt ſuch another infuſion, put it into my pocket, as before, and an hour afterwards laid a drop of it before the microſcope, while it was as yet milk warm. I obſerved a very few of theſe minute bodies moving about briskly in the fluid. An hour after this more of them appeared; and before the end of the third hour, the infuſion contained a great number of them. They continued however to increaſe in numbers for an hour or two afterwards, when the infuſion ſeemed to have produced all that it was capable of.

June 3d. I made an infuſion in the ſame way of unbruifed cantharides, and in much about the ſame time found the whole ſwarming with animalcules of the ſame kind as thoſe of the infuſion of millepedes.

Theſe bodies, which at firſt appeared larger than thoſe in ſemine maſculino, were very ſoon decompoſed into ſmaller ones, to ſpeak according to the doctrine of Meſſrs. Needham and Buffon, or, as others would rather incline to expreſs it, ſucceeded by ſmaller ones, theſe again by others ſtill ſmaller, and ſo on, until in a few days, the higheſt magnifier of my microſcope could exhibit nothing diſtinct to the eye.

The ſame ſubſtances infuſed in rectified ſpirits of wine, or other ſpirituous liquors, ſhewed none of theſe bodies, and a few drops of ſuch liquors, or of a ſolution of fixt or volatile alkaline ſalts poured into the infuſions, inſtantly deſtroyed the animalcules.

I ſhall not take up time in enquiring, whether theſe animalcules are produced by the decomposition of the ſubſtances, in which we obſerve them, which, according to Monſ. de Buffon contain a number of
living

living organic particles, or, according to Mr. Needham, a vegetating force in every microscopical point, capable of forming secondary combinations, microscopical plants, zoophytes or animalcules, according to the greater or less degree of exaltation, which the several substances have attained. Or whether they proceed from ova formerly existing in the substances, and capable of enduring a great degree of heat, without being destroyed, the germs of which are sooner or later developed according to the fitness of the nidus, as is the opinion of the learned and ingenious Dr. Parsons, in his treatise of the analogy between the propagation of animals and that of vegetables.

As by entering into a discussion of these different sentiments, one might write a large volume without perhaps going to the bottom of the matter, I shall here only observe, that whichever of these opinions we embrace, thus far seems to be certain, that the earlier or later appearance of microscopical animalcules is always in proportion to the degree of tendency to putrefaction in such substances as afford them. This is the case not only with them, but likewise with maggots in meat, which all the world knows to be produced from the eggs of flies.

The two substances millepedes and cantharides, upon which the above observations were made, are remarkably putrescent, and the infusions of them stunk abominably in a very short time.

Castor, though an animal substance, and seemingly very much exalted, treated in the same manner as the above-mentioned substances, viewed by the microscope every day, and kept for several months, afforded no animalcules, nor seemed to have under-

undergone the smallest change; which confirms what the ingenious Doctor Pringle has observed, that it is antiseptic; and adds weight to the observation, which I made above, that the appearance of such animalcules denotes a tendency to putrefaction. Hence I am of opinion, that such microscopical observations made with care and accuracy, might be usefully applied in the investigation of the septic and antiseptic qualities of animal and vegetable substances, since in this way the first motion of putrefaction may be discovered before it manifests itself otherwise.

As every one would wish, if possible, to render his studies or observations (however philosophical, or otherwise agreeable they may be) in some shape subservient to the good of mankind, here seems to be pointed out a new and interesting field of enquiry for those, who delight in microscopical researches.

Before I conclude, I must beg leave to subjoin a few remarks concerning exaltation, which seem to deserve attention.

All exaltation appears to be a certain modification of the salts and oils of bodies: a proper degree of it favours growth and vegetation, and sustains animal life: a greater degree of it, which I would call the putrefactive exaltation, and to which all organized bodies tend more or less, decomposes all such bodies, and favours the production of microscopical animalcules, or the developement of the ova, from whence they may be hatched. A still higher degree of exaltation puts a stop to this process, as likewise to vegetation, and in certain circumstances even to animal life, as happens with regard to all acrid

chemical preparations, &c. whether of the animal or vegetable kingdom.

Those, who imagine, that all salts and oils hurt the vegetating force of matter, have fallen into a great error; for from whence can such a vegetating force proceed, but from a due mixture and modification of the salts and oils with the earthy principle, which all the world allows to be of itself inert?

It is true indeed, that a very large portion of salts or oils renders substances antiseptic, or very slow either of vegetation or putrefaction, as is well known with regard to sea-salt, a large quantity of which preserves substances from putrefaction; though, as the learned Dr. Pringle observes, a smaller one rather forwards that process, as it does likewise vegetation. Castor, which as I formerly observed, is antiseptic, seems to owe this quality to nothing else but a large quantity of a sluggish fetid oil, which it contains.

LXXXIII. *An Account of a Cure of a paralytic Arm, by Electricity: In a Letter from Cheney Hart, M. D. to Mr. William Watson, F. R. S.*

Salop, March 20, 1756.

Read Mar. 25, 1756. **T**Hough 'tis a long time since I had occasion to write to you, yet I take the liberty of now troubling you with a letter, to acquaint you with the case of a young woman I lately have had under my care at the infirmary here, upon whom

whom the electrical operations have had greater good effect than I have ever else been able to observe. Elizabeth Stokes, aged twenty-three, a very lusty and healthy woman, was, in the beginning of January last, seized with a rheumatic kind of pain in her right arm, particularly about the wrist; and in two or three days time afterwards, the finger and thumb of that hand contracted up so close, that they could not be opened with any force the girl herself could use to them. In this manner she continued till January 17, when she came to our infirmary: her hand and fingers then seemed to be greatly swelled, but close drawn together; her arm was pained from the contraction of her hand; and from a creeping pain she felt about her wrist and elbow, she was apprehensive those joints were about to be drawn up as the hand. She had at this time lost all kind of sensation in the hand itself, which felt cold to the touch, and looked livid. In every other respect she was in perfect health. Imagining the contraction a consequence of the rheumatic pain, I advised her to the use of gum-guaiac. twice a day, with a julep of sp'r. mindereri, &c. as in our own Pharmacopœia, and to rub the part affected well, thrice a day, with a flesh-brush, and afterwards with linimentum saponaceum. This she continued five days without the least observable alteration; when finding her no better, I directed our apothecary, Mr. Winnal, to draw the electrical sparks from the contracted hand, and to communicate the shock also, by means of the w re-chain tied about her wrist from the suspended ph'al. This he undertook to do on Friday the 23d, and for the first half hour the girl did not seem at all sensible of the

electrical strokes; but after about 30 minutes, she said they gave her pain in that hand, and in about ten minutes more her fingers began to tremble and open so much, that we could easily separate them, and by degrees extend them all. After this the shock was given to the palm of her hand, to each finger separately, and to the thumb and wrist for about ten minutes longer, when the whole were become perfectly pliable and soft, and she could open and shut the hand herself, without assistance, and without pain; though she found herself unable to use those fingers very freely, they being very weak, as well as that wrist. We then rubbed the hand and wrist well with opodeldoc, and wrapt it up close in flannel, and recommended to her to repeat the rubbing it frequently through that day, and continue her guaiacum as before. She remained very easy and well all day, but at night her hand began to be more painful, and she expressed a great fear, lest it should contract again, as she felt a creeping pain in all the inside of her arm. However, by repeated friction with the flesh-brush and opodeldoc, this went off, and next morning she had no complaint in her arm or elsewhere. She was again electrified this second day about the hand, which remained open and pliable enough, and the operation was repeated every day for a week after, (tho' the contraction never returned again) till the shock began to be so painful, that she desired to be excused from it any more, and, as she seemed quite well, she was discharged as cured from the infirmary on January the thirty-first.

As she was a working servant to a family in the country, she returned to her business with the same ease

ease as formerly before this contraction, and continued well till on February ninth or tenth, when being obliged to wash clothes from morning till night, that same evening after the washing was finished, she felt her fingers and arm grow painful first, and in less than an hour's time they contracted, as they had done before. Attempts were immediately used by herself and the family to draw the fingers open, but in vain, and whenever they tried to force them open, they gave the girl most violent pain through that whole arm. On this she was brought back to our infirmary again, Feb. 13, and electrified as before, in the presence of myself and several gentlemen of this place. Her hand was now as closely contracted as seemed possible for the fingers to be drawn, and she had no sensation of heat or cold upon it, nor pain. The wire from the suspended phial being tied round that wrist, she applied her hand to the electrified conductor, and received repeated strokes, and some very strong ones, for 40 minutes before she felt any pain from it, or the fingers relaxed any at all; and we rubbed her frequently with the flesh-brush betwixt whiles, and tried to stir her fingers. After about 45 minutes, she said, each time she received the electrical shock, it gave her much pain, and then her first finger began to move a little, after that the second, and the third, and the thumb, till at length they were all opened and relaxed, and by repeated frictions and electrical strokes, for about an hour and 20 minutes, the motion of the hand was quite restored. I then directed it to be rubbed well with opodeldoc and covered with flannel, to keep it warm, and heard no more of her till seven o'clock
at

at night, when her arm was become vastly painful, her fingers trembled and drew up a little, and the inside of the fore arm felt all knotty, and as if the muscles there were drawn like cords, and the whole hand and arm was sore. In this case I would have had some blood taken immediately from that arm; but upon inquiry I found her menses were upon her since the electrifying in the morning. I therefore only ordered a blister above the elbow of that arm, and a proportionate quantity of *tinctura Thebaica* to be added to the *linimentum saponaceum*, with which her fore arm and hand were to be well rubbed. These applications soon took off the threatening symptoms, and next morning she was easy; the knots in her arm almost quite disappeared, and she could move her fingers very well. She was electrified the second day about ten minutes, but no longer, as it seemed unnecessary; and from this time was electrified no more, but continued the anodyne liniment every day, with the use of the flesh-brush, for about ten or twelve days longer, when she appeared perfectly well as before, and her fingers could be used and moved with ease. Nevertheless, to prevent a return, I directed an issue to be cut in that arm, and worn constantly, which she had done, and she had also a strengthening plaister about her wrist, as she said that was weaker than it should be. This was the whole of her treatment. She was kept a patient here till this day, March 20, when, as her disorder has no more returned, and she can move her fingers perfectly well, she was discharged from hence cured.

I will not weary you with remarks upon this case, nor on the strong hints it affords of the wonderful force

force and virtue of electricity in rheumatic or spasmodic disorders. Certainly it is worth while to make further experiments to ascertain its use in medicine, as well as in philosophy. The Swedish experiments made by Dr. Zetzell, (as related in the *Gentleman's Magazine*, 1755, p. 314) directed me to the trial of it in this case, wherein I have the pleasure to see an admirable agreement in the effect here and in Sweden. As such therefore I send this account to you, which, if you think it may be of use, you are at liberty to communicate to the gentlemen of your Society, for whom I have a great esteem, and should be glad to hear, at your leisure, from you, what new discoveries have been made by any of you this winter, in any of the arts or sciences. I must now beg leave to conclude with subscribing myself,

Dear Sir,

Your very obedient humble servant,

Cheney Hart.

LXXXIV. *Observations made upon the Brimstone-Hill (in French La Souffriere) in the Island of Guadelupa; by John Andrew Peyssonel, M. D. Member of the Royal Academies of Sciences of Paris and Montpellier, and of Marseilles and Rouen; the King of France's Physician and Botanist heretofore on the Coast of Barbary, and now in the Island of Guadelupa, F. R. S. Translated from the French by M. Maty, M. D. and F. R. S.*

Read Mar. 25, 1756. **T**HE Island of Guadelupa is not the only one of the American Antilles, that has Volcanoes and mines of brimstone; few are without them. They are to be found in Martinico, Dominica, St. Christopher's, St. Lucia; and all these islands produce sulphur, pumice-stones, and other substances usually found in Volcanoes.

The mountain, upon which I made my observations, is called La Souffriere, or Brimstone-hill, because it contains ores of sulphur; and its summit constantly emits smoke, and sometimes flames. It is very high, and forms a kind of truncated cone. It rises above the chain of mountains, that occupy the center of the island, and run through all its length from North to South. This conical mountain is about three leagues from the sea shore, East, West, and South, and therefore almost in the middle of the Southern part of the island.

The

The journey up this mountain is not now so difficult as it was in the time of father Labat, in the year 1695. Much more commodious roads are now used than that which he followed. Travellers generally lie at some house at the foot of the mountain. From thence they go on horseback as far as the torrent, where they have the choice of two different ways. The first begins at a place called Les Gommiers, or The Gum-trees, along the river of Galleons; the other lies towards the middle of the mountain, at a place called Tarare, where they cross the river St. Lewis.

You generally set out early from the place where you have spent the night, and breakfast in the cool of the morning, on the banks of one of the rivers, whose waters are very clear and good, and produce great quantities of small fish, such as cray-fish, bull-heads, eels, &c. This is one of those delights so emphatically described by father du Tertre. We perceived these waters to be diuretic, by the sudden effect they had upon us.

We took the road of the Gum-Trees as being the easiest. I soon observed, that the woods differed in kind, as we ascended; the trees are smaller, and are no more than shrubs at the top, that is to say, on a level with the other mountains. Here you meet with none but mountain-mangles, whose wood is crooked and bends downwards. The bark of these mangles is a true jesuit's bark*. When we had passed through this forest of mangles, which are as

* F. Labat made the same observation. See *Voyage aux Isles de l'Amerique*. Tom. II.

a curtain, we got into the savannah. A savannah in this country is a kind of natural meadow. This particular one is made up of fern, moss, a sort of ananas, and wild aloes, and such-like plants, without either tree or shrub. I believe we met with almost all the hundred different sorts of fern, which make up father Plumiere's voluminous work.

We walked on for about 600 paces, in a path that goes through this savannah. The way is rugged. The ananas, that are very bushy and above two feet high, conceal the roots and rocks, which makes walking very troublesome. About nine in the morning, after an hour's march from the place, where we had breakfasted, we arrived at the spring-head of the river of galleons, South of the Brimstone-hill. At the place called The Three Springs, we found the the waters so hot as not to be borne. The neighbouring ground smokes, and is full of brown earth like the dross of iron. In other places the earth is red like colcothar, and even dyes one's fingers; but these earths are tasteless. Near these three burning hot springs are some others, that are lukewarm, and some very cold. We put some eggs into the hot ones, and they were boiled in three minutes, and hard in seven.

I had brought a hydrometer, or instrument to weigh liquors, which plunged six lines in the common water of the rivers to leeward, and two lines in sea water. It sunk twelve lines in the hot, and eight in the lukewarm springs.

When we had made our observations on the different sorts of earth and water, we entered a valley between The Brimstone-hill and the mountain, that
lies

lies Southward, called 'The Mountain of the Three Rivers. Here we met some people carrying brimstone to sell it in the low-lands. We waited in the same savannah, and among the same weeds, which grew so thick, that we could not discover the nature of the soil.

We went on, about the length of 400 paces, when we began to get sight of the windward, or of the Eastern coast of the island. Having likewise discovered the burning gulph to the Northward of us, we crawled up to get at it. We were obliged to help our selves with our hands, feet, elbows, and knees, and to hold by the fern, aloes, and other plants, some of which were prickly, and very troublesome. We were about an hour and a half getting up to the hight of about 500 feet; tis true we might have taken a smoother way by going round about. At last, quite out of breath, we reached the gulph, at the place whence the smoke issues. This place is at the foot of a steep bank, and may be about 25 toises in breadth: there is no grass to be seen, nothing but sulphur and calcined earth; the ground is full of crevices, which emit smoke or vapours; these cracks are deep, and you hear the sulphur boil. Its vapours rising yield very fine chemical flowers, or a pure and refined sulphur. It is chiefly found in those places where the earth lies hollow, and upon the chinks or funnels you see the spirit of sulphur run down like fair water, and you breathe an intolerable smell of brimstone. The ground is loose, insomuch that we could thrust our canes up to the head, and drew them out as hot, as if we had plunged them into lime when it is slaking. Having inadvertently run

ourselves into this loose ground among these chinks, and being smothered with the smoke or vapours, we were continually afraid of sinking, and meeting with some hole or pit, and so tumbling into hell from the top of this mountain, which we imagined to be one of the vents of the infernal regions, or a mouth of the burning gulph; and we expected to perish like Pliny the naturalist, who was smothered by the flames of Vesuvius, which is said to have happened in the 79th year of the Christian æra, at the time of that great earthquake, which, having overturned whole cities, drove the ashes as far as Africa, Syria and Egypt. I confess, the distance, that these ashes are said to have travelled thro' the air, appears to me to be very great, for Italy is near a thousand leagues from Syria.

We hastened out of this dangerous situation, and continued climbing to the top of the mountain, keeping to the East, or windward. When we got to the summit, we discovered another gulph or funnel, that opened some years since, and emits nothing but smoke. The top of the mountain is, as father Du Tertre says, a very uneven plain, covered with heaps of burnt and calcined earth of various sizes; the ground smokes only at the new funnel, but appears to have formerly burnt in many places; for we observed abundance of these crevices, and even gutters, and very large and deep chinks, which must have burnt in former times.

The same reasons, that obliged us to quit the burning gulph, probably hindered father Labat from viewing this summit, and prevented his coming at the knowledge of a very deep abyss, or precipice, which is in the middle of this flat.

It is said, there was once a great earthquake in this island, and that The Brimstone-hill took fire, and vomited ashes on all sides. This mountain then cleft in two; but it is not said what year this phenomenon happened. I am apt to think it was then, that this abyss or precipice opened. Perhaps the Volcano having been fired by lightning, the salts of the earth joined with the sulphur produced the effect of gunpowder, and occasioned this dreadful earthquake. The mountain having split, cast forth ashes and sulphureous matters all around, and from that time no earthquake has been felt in the island.

These phenomena are but too common in Italy, particularly in the kingdom of Naples; and in other countries where there are Volcano's, we are told of most terrible disasters of this kind. In 1556 a Volcano in the island of Java poured forth a torrent of melted and burning sulphur with such impetuosity, that ten thousand persons perished in three days. The same year mount Guamanapi, in one of the Bandava islands, made terrible havock; the waters of the sea were heated to such a degree near the island, that the fish were found ready boiled upon the strand, but we don't hear, that any of those mountains ever split in two like this.

We cannot doubt of the dreadful effects, which have been, and still are produced by earthquakes: witness the last that happened at Jamaica, and now that of Lisbon.

The abyss I am speaking of, is in the middle of the flat, behind two crags or points, that rise above the mountain, and on the North side answers to the great cleft, which goes down above a thousand feet
perpen-

perpendicular, and penetrates above a hundred paces into the flat, and is more than twenty feet broad; so that in this place the mountain is fairly split, from the top down to the basis of the cone.

On the North side, opposite to the cleft, and at the foot of the mountain, in a little plain, is a pool, which is said to ebb and flow like the sea, and to increase and decrease at certain times, according to the periods of the moon: but people are fond of ascribing wonderful properties to things, which, if simply related, would not appear so extraordinary. For my part, I am apt to think this pool is formed by the waters that drain along the great cleft into this little plain, where the same earthquake has sunk a hollow place near the great subterranean cavern, of which by and by; and that the variations of the water in this pool are occasioned by the rains.

It was about noon when we got upon the flat, on the summit of the mountain. It looks as if it had formerly been of a conical figure, and had lost its top by earthquakes. What confirms me in this conjecture is, the pieces of rock, which still subsist, and form those spires, or little cones, that are scattered here and there upon the summit; the two most considerable of which are towards the West, and make as it were, a pair of horns to the mountain.

Here we dined, and rested above an hour. There is a most delightful prospect. You discover below the islands of Martinico, Dominica, The Saints, Margalante, and the whole extent of Guadelupa. 'Tis said, those of St. Vincent, St. Kits, and even St. Martin, have been seen from the top of this mountain. Be that as it will, we observed very distinctly

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Montserrat, Antigua, Nevis, Radonde, and several other islands.

The air at top is bleak and sharp, but I can't say I found the cold very intense. It is true many negroes have perished there with cold; but that is not to be wondered at, as these people are not inured to the severity of the weather, and go naked; they wear no clothes but a pair of drawers, and have nothing to eat. Sometimes they are caught in the rain, or exposed to damps and fogs; or else when they are all in a sweat with fatigue and labour, and lie down to rest, the cold seizes them and chills their blood; and it is no wonder, if they perish in this condition.

Besides the fine prospect you enjoy at the top of this mountain, you have the pleasure, as father Du Tertre observes, of seeing the clouds gather below, and hearing the thunder rumble under your feet. We actually saw the clouds rise from the sea, and spread over the land on the side of the wind, sometimes passing where we stood, and sometimes lower. These clouds are no other than damp fogs. The Brimstone-hill is seldom clear of these damps.

As my thermometers and barometers were broke in going up, I could make no observations on the gravity and properties of the air. It was but in my subsequent journeys to this mountain, that I could in some measure gratify my curiosity in these particulars. We had only time to examine the great cavern and the great cleft above it, and then withdrew to the habitation whence we came, being very weary; for in coming down we were often obliged to slide, sometimes sitting, sometimes lying on our backs, and holding by the fern. We frequently tumbled into holes,
where

where we were almost buried, but were in no great danger, because the fern and moss make a kind of down, pretty rough indeed, which prevents the hurt of a fall; but all this is very tiresome. We met with abundance of holes or nests of black devils, a kind of sea birds, that come from the north, and hatch their young upon this mountain. The birds alone would require a dissertation, which I hope to give hereafter.

Second Journey to The Brimstone-hill.

My curiosity was not satisfied; I wanted to make more accurate observations, and take a more exact view of this mountain. We climbed up a second time with the same and still greater difficulties, because we took the road, that leads to the middle of the mountain. This road is called Tarare, and was to bring us to the pool near the great cleft and the great cavern. I had provided myself with all necessities for making observations.

We arrived at the little plain, where the pool is. The three times I have seen it, it was little more than 20 or 25 feet square, and contained but little water, which was very ill tasted, and so impregnated with alum as not to be fit to drink. It is situated opposite to the great cleft, about an hundred paces from the great cavern, that is under the cleft. As I intended to lie there, when we got to the place, we pick'd up some wood, kindled a fire, made bundles of fern, and fetch'd water from the head of the river St. Lewis.

We took up our lodging in that great cavern, that answers perpendicularly to the cleft of the mountain.

It

It has no doubt been formed by the same earthquake, that split the mountain in two parts nearly equal. The parting goes North and South; to the North is the cleft and the cavern, in the middle the abyss, and to the South the burning gulph; the whole on a direct line.

This cave appears at first sight very deep, but you get down with ease. At the entrance it may be about twenty 20 or 25 feet wide, as much in height, and about 60 paces deep. At the bottom is a kind of pool, formed by the waters, that drain or ouze from different parts of the vault. The bottom of this pool appears to be an exceeding fine miry earth, like clay mixed with ashes. The water, that distills in these places, is very acid, astringent, sharp, and tastes of alum. The water of the other pool on the outside is much of the same nature, but contains fewer salts; which is a proof, that these two pools are both filled with the waters, that drain from the great cleft. The interior pool may be about 15 feet wide across the cave: They have thrown up a kind of bank, made of rocks, to cross it without sinking into the mud. Before we entered the cave, we lighted some torches made of candle-wood, which I had taken care to provide. The candle-wood is full of resin and very inflammable; the inhabitants cut it in splinters, and tie it up in bundles, which they call torches. When they were well lighted, we crossed the pool, and got upon a small eminence made of stones, that have fallen or separated from the vault: you then go down into a great hole or cave, about sixty feet in length, as much in breadth, and forty in height. Here the heat is mo-

derate. My guide got up upon a second eminence, but told us he was stifled, and could advance no further ; and indeed his torch was going out. This second eminence, or rising, is likewise formed by stones falling from the vault. They are a kind of whitish free-stone, covered and incruited with a very sharp, white, aluminous salt. I then took a torch, and having left a negro at the entrance with another torch to fetch us out, in case of need, we entered the third cave. Here the heat is excessive, the torch gave no light, and was almost extinguished for want of air, so that we were obliged to wave it about continually. We could hardly fetch breath, and were covered with sweat, and found nothing remarkable but this violent heat. The vault ends here, and we could go no further. We perceived on the left, at coming in, a great hollow place, where we heard the falling of water ; we imagined the vault continued on that side, and stepping down were agreeably surpris'd to find it cool, and that our torches revived. The space of one fathom made this alteration ; for holding our torches in the right hand extended, they could hardly burn ; whereas in the left stretched out, they burnt very clear. This puts me in mind of what happens in the *Grotta de' Cani*, near Pozzuolo in Italy, described by Miffon, vol ii. p. 63. let. 23. too long to be related here.

I went down to the bottom of this hole, where I found nothing but a surprizing cool air. Afterwards we found several holes full of water, less impregnated with salt and a'um than that at the entrance. When we came up again, in order to proceed on our way, we were suffocated with the same heat we had felt in
coming

coming in. I endeavoured to advance to the light of the cave, but the heat was so violent, that it stopt my breath.

It appeared to me pretty extraordinary, that in one and the same cave, 300 feet under-ground, there should be such a stifling heat on one side, and on the other such an agreeable fresh air. Perhaps the cool side answers to some vent, or communicates with the great cleft by some unknown channel, thro' which the outward air penetrates and cools the place.

In coming out we took care to rest a considerable time in the second cave, to let the violent heat go off, and to dry our shirts, that were soaked through with sweat. We brought away some of the incrustations, and some of the aluminous salt, which I found to be a true alum.

When we came out, I perceived two remarkable things upon my waistcoat; first, that the silver lace was gilt, and looked like tarnished gold lace: but this I was not surprized at, as I knew, that sulphur mixed with salt of tartar will produce that effect: secondly, that the drops of water, which were fallen upon me, were by the heat of the cave turned to alum, and had dried and fastened upon my cloaths. In this cave we found the same sorts of earth as we had met with at the three springs of the river of Galleons, as I mentioned above. They dyed our fingers, and were tasteless, as the former. This is all I observed in the interior cave.

We spent the night in the great cavern. I had brought with me a thermometer and a barometer; but this last was broke by the way, so that I could

make no observations upon the weight of the air; but with the thermometer I observed, that when we got there, in rainy weather, the glass shewed 15 degrees above temperate, at sun-set 2 degrees; in the night 5 degrees below temperate; and at day-break 8 degrees. The thermometer, placed at the entrance of the cave, and sheltered from the wind, shewed 5 degrees of cold; and exposed to the wind on the outside, where I felt a very sharp cold, only 2 degrees; so that there was three degrees difference, which surprized me, as my natural thermometer, I mean my body, convinced me of the contrary. I was very cold without, and felt little or no cold within; whereas the observations by the thermometer shewed the reverse. I had observed in the plains below, that it shewed about 10 degrees above temperate. By the report, that was made us, the night we spent at the brimstone-hill had been as cold, the wind had blown, the air was very damp, and we had found but 5 degrees of cold; so that there was 18 degrees difference between the brimstone hill and the plains.

We spent the night very snug upon beds of fern, with a good fire at the mouth of the cave, and were much less troubled with the cold than I expected in so bleak a place.

We came down by the Tarare, which, as I have observed, is a very steep descent. You let yourself down upon a narrow ridge. On each side are precipices, which indeed do not look frightful, because they are covered with trees which conceal them. Half-way down the mountain you find a hot spring, that has nothing particular. At last we got to our
horses,

horses, and reached our habitation at the close of night.

Any quantity of brimstone might be fetched from this mountain, even ship-loads. It might be refined upon the spot, or made up into lumps to be sold, and shipped in the ore, if it was necessary; and should this scheme take place, I do not question but the roads might be made easier, so as to load it upon mules at a hundred paces from the gulph: but it is too cheap a commodity to be worth gathering up in a country, where the price of labour is so high from the scarcity of hands. Bright yellow brimstone with a greenish cast might be gathered round the vent-holes of the burning gulph, and likewise large quantities of fine natural flowers, or very pure sulphur. What we call flowers of sulphur is brimstone sublimated, raised and fixed into a very fine and subtle powder. These chymical flowers harden and cake together, and form a solar sulphur as fine as that, which comes from Peru. It is of a bright gold colour. It is found on the sides of the burning funnels or vent-holes; and likewise upon the ground, at the foot of the great cleft northward, is found a kind of brimstone resembling karabe or yellow amber, and altogether as bright and transparent, so as to be mistaken for it. These are particles of sulphur washed and purified by the air, rain, and sun, and I do not think it is possible to see any thing more beautiful of the kind.

I do not doubt but these two sorts of brimstone would be as much valued as what comes from Peru; which being mixt with salt of tartar, produces that liquor, which is made use of to gild metals, and chiefly silver.

In the same funnels you see the spirit of sulphur rise against those sulphureous crystallisations, and drop down like very clear water. The chemists agree, that sulphur is no other than an oily matter fixed by an acid spirit. This is evident from artificial sulphur. By mixing oil of turpentine with spirit of vitriol you obtain a sulphur equal to natural brimstone. It is farther proved by analysing it. An acid spirit may be extracted from it, and its ashes afford but a very small quantity of alkaline salt. What passes in this mountain may be called a natural analysis and distillation. The brimstone takes fire in the center of the earth, as in chemical operations, when the mixture of spirit of nitre and oil of turpentine suddenly produces a surprising heat and flame: in like manner an oily and sulphureous exhalation inflames and sends forth fires, which the ignorant vulgar take for shooting or falling stars.

The flowers rise with the acid spirit, which being condensed by the cool air, falls down in drops. By fixing bell-glasses to the apertures of the funnels, one might collect a spirit, that rises naturally. One of us having thrust his cane too far into one of the funnels, and not being able to pull it out again, helped himself with the blade of his sword to catch hold of it. In an instant we saw the hilt quite wet, and the water dropping off, and when he drew it out, we were surprized to find the blade extremely hot. We could not then save any of this spirit, nor make any experiments upon it. However, I do not believe it is like that, which flows from the baths of Wolckenstein in Germany, which Charles Patin says turns to brimstone when

when exposed to the air, and is liquid and clear as water under-ground.

I have gone up this mountain several times to gather simples ; but as the plants it produces, have already been described by the Rev. Fathers Plumier and Feuillée, the two minims, who went for that purpose upon the mountain called Pelée, in the island of Martinico, which is likewise a volcano, and produces the same plants as the Brimstone-hill of Guadelupa ; I shall forbear giving an account of my enquiries in this particular.

LXXXVI. *Account of the Earthquake, felt February 18, along the Coast of England, between Margate and Dover, in a Letter from Mr. Samuel Warren, Supervisor of Excise, to John Windham Bowyer, Esq; one of his Majesty's Commissioners of Excise. Communicated by John Pringle, M. D. F. R. S.*

Honourable Sir,

Read April 1,
1756.

PUrsuant to an order from Mr. Noble, bearing date the 11th instant, I have made inquiry, as therein directed, relating to a shock of an earthquake, which happened on Wednesday the 18th of February last ; and find, that at Margate it was felt by Mr. Valentine Jewel and his family just before eight o'clock in the morning: they
being

being all in their beds, each person observed their respective beds to have a sudden shock, as quick as thought itself. Mr. Barber, who lives at the king's-head-inn, and next door to Mr. Jewell, at the same time, felt his bed to tremble for the space of half a minute; his wife (who was in child-bed at that time) and her nurse felt the like trembling in another room, and Mr. Barber's mother (who keeps the said inn) saw the door of her room to shake, which she thought then to have caused by the wind; and in like manner it was felt by many other people in Margate. I cannot find, that it was felt by any person in Ramsgate. At Deal, Dr. St. Leger, being in bed on the 18th, a little before eight o'clock in the morning, felt the bed to shake under him, which he supposed to be a sudden gust of wind, till he heard other people talk of an earthquake, which they then imagined to be the cause of their beds shaking.

At Dover, on the above day and hour, five or six people felt their beds to shake under them; but I can't find they thought any thing of an earthquake 'till they saw it in the public papers.

At Sandwich the Rev. Mr. Bunce saith, that on the above day and about the same hour, he being in bed felt two shocks as quick as possible one after the other; and he further saith, that had he not read the several accounts of earthquakes abroad, he should not have taken the shock to have been of that kind. In like manner it was felt by sundry persons in Sandwich. For my own part I felt nothing of it, nor can I hear, that it was felt by any person, that was out of bed, save at Sandwich, one Mr. Thomas Hayward, who was sitting in his chair, felt the same to shake

shake twice; and a maid servant of Mr. Jervas Hayward, of this town, being ill, and sitting in a chair, she felt it shake twice. Mrs. Sims and her daughter at Canterbury felt their beds shake on the above day and hour. The morning, at that time, was calm, but very hazy; soon after we had a very great tempest. If any thing further shall occur worth notice, I will give your honour an impartial account thereof. I am,

Honourable Sir,

Sandwich, March 25,
1756.

Your most dutiful

humble servant,

Samuel Warren.

LXXXVII. *Remarks on the Stones, in the Country of Nassau, and the Territories of Treves and Colen, resembling those of the Giants-Causey, in Ireland. In a Letter to Thomas Birch, D. D. Secret. R. S. from Mr. Abraham Trembly, F. R. S. Translated from the French.*

S I R, Conduit Street, March 28, 1756.

Read April 1.
1756.

BEING in the month of September last at Weilbourg in the country of Nassau, I was informed, that there were found in the neighbourhood a great quantity of stones, of a pretty

regular shape, and of a considerable size. I judged from the account, which I had of them, that they resembled those, which formed, what is called in Ireland, the Giants-caufey. I was more and more confirmed in this notion, when I saw some of those stones in a pavement. Upon finding, that the quarry, whence they were taken, was at no great distance, I went to it the day following. It is in a wood, upon the declivity of a hill. It has not yet been dug into above twenty feet deep, and forty long. I distinctly perceived, that this quarry consisted of a mass of stones of an almost regular form. I examined carefully all those, which presented themselves to my view. I caused some of them to be detached from the rest; and I searched with attention the parts about this quarry. I could not discover at what depth these stones are to be found under-ground. They appear very near the surface of the earth, where the quarry, which I am speaking of, lies. And there was a pretty considerable space of ground, in which the top of the stones appeared, and where it was easy to examine the shape of their upper ends. It is very far from being the same in all of them: but when a great number of them are compared with one another, we find reason to conclude, that the hexagonal form is the most common. The more regular the figure of these extremities is, the more it approaches to that of an hexagon. The two ends of every stone appeared to me, for the most part, to have the same shape. The sides of the stone are of the same form with the ends, and are plain. Every stone is therefore a prism of a certain number of sides. They are from three to eight sides, and of
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all the intermediate numbers. The length of the prisms is not equal. I saw none of less than two feet long; and I have seen some of five. The thickness of them is not at all more equal: it is of nine inches and under. Many of them form a pillar by lying one upon another. All those, which I saw, had their extremities plain, and consequently were not jointed into the other. They seemed to me not at all joined together.

The pillars, formed by several of those stones, are placed exactly one against the other, without having any void between them. They are in a situation almost perpendicular.

Upon breaking these stones, their colour appears clearly to be black. It is a kind of pretty hard basalt. It strikes fire with steel; and it appears to be very like that of the Giants Causey in Ireland.

This stone must be very common in the country of Nassau. I have been assured, that some leagues distant from Weilbourg, there is an old castle almost intirely built of it.

I went from Weilbourg to Coblentz in the electorate of Treves. I observed on the road thither, in the towns and villages, through which I passed, that this basalt was made use of in the buildings and pavements. I made the same remark in my journey from Coblentz to Colen thro' Bonne. I found a pretty large heap of it in a village three leagues from Bonne. These stones seemed to be collected in order to be made use of. I met with no person, of whom I could inquire, whether there was a quarry in the neighbourhood. In continuing my journey

along the Rhine, in my way to Bonne, I saw in the river, the waters being pretty low, a rock, which stood a foot or two out of the water. Examining it nearer, I found it to be a mass of those prisms of basalt, the heads of which appeared; and I had all imaginable reason to think, that it was the top of a natural mass of the stone. I was convinced by this, that there were quarries of it along the Rhine.

If, in coming near to Bonne, a person examines the parapet walls, which are built on both sides of the high road, he will find them to be of these basalt stones. There are many of them in the old walls of the ramparts of Bonne and Colen, and in the pavements of those cities.

After I had made these observations, I was informed by Mr. Emanuel Mendez da Costa, that some authors mention quarries of this basalt in Upper and Lower Saxony, and in Silesia. I do not know, that those in the country of Nassau, and the territories of Treves and Colen, have been described.

I thought proper, Sir, to communicate to you what little I have learned in a journey, in which I had not time enough to make, upon so curious a subject, all the researches, which I could have wished.

One cannot know too many particulars of this remarkable stone, or compare too many of the facts, which they offer to attentive observers. This is the true method of attaining, if possible, some knowledge of this natural curiosity.

Those, who have made observations upon salts, and inquiries into stones, minerals, and metals, know how common crystallisations are in nature. A very
great

great variety are found in searching mountains, visiting caverns, and descending into mines. There are few of the naturalists, accustomed to these researches, who shall observe the basaltic above-mentioned, but will be inclined to consider them as so many crystallisations. I do not think, that the great extent of these masses, which have been discovered, and the bigness of the stones, which compose them, form any objection against this notion. I am, with very great esteem,

S I R,

Your most humble

and most obedient servant,

A. Trembley.

LXXXVIII. *An Account of a Work published in Italian by Vitaliano Donati, M. D. containing, An Essay towards a Natural History of the Adriatic Sea: By Mr. Abraham Trembley, F. R. S. Translated from the French, by Thomas Birch, D. D. Secret. R. S.*

Read April 1,
1756. **T**HIS work of Dr. Donati, printed at Venice in 1750, is written in Italian, in the form of a letter addressed to Monsignor Leprotti, physician to the Pope, dated at Knitz, on the borders of Bosnia, the 2d of November, 1748. This letter contains but a small part of the observations

tions, which have been made by Dr. Donati. He has collected them into a much more considerable work, in which he had already made a great progress. The subject is very extensive, and one of the most curious; and certainly requires, in order to its being treated of in a proper manner, all the genius, patience, and resolution, which distinguish Dr. Donati to so much advantage among the naturalists.

The sea contains a prodigious number of organized bodies, very difficult to be observed on account of their situation; extremely different, in many respects, from the plants and animals of the earth; and which, for that reason, must necessarily discover to us new laws in nature.

Dr. Donati has not confined himself to these objects, tho' so numerous and so interesting. The observations, which he has made upon a great number of marine fossils found in the earth, and upon the several soils, in which they are discovered, have led him to think, that there must be some affinity and resemblance between those parts of the earth, which are actually covered by the waters of the sea, and those, which are not so. This idea, as is easily imagined, has opened a vast field to his researches. He was engaged by it to examine carefully the various soils of the countries, which surround the Adriatic sea, and to endeavour to discover the different fossils contained in them. But, what is a still more difficult and newer task, he was induced to try to make himself master of the nature of the soils and the fossils at the bottom of the sea, in order to be able to compare the one with the other.

Dr. Donati had recourse to different expedients for observing the bottom of the sea. He took the advantage of calm weather, to view it from his bark to the depth of twelve or fifteen feet, in places where the water is transparent. By this means he informed himself, what the disposition of the soil is under the water to a certain depth, and what the bodies are, which cover it. He then drew up those bodies into his bark, that he might more closely examine them. For this purpose he contrived the instruments described by him, with which he was enabled to take up from the bottom of the sea, even to very great depths, marine bodies and masses of a considerable bulk. In this manner he passed through the northern part of the Adriatic Sea, and made use of these instruments for many miles of ground. On the coast of Italy he extended his search as far as Ancona; and, on the opposite shore, he proceeded to the farthest parts of Albania, and stopped at the gulph of Lodrino.

These coasts are bordered with a great number of islands and rocks; some of which lie at a pretty distance from the shore. Dr. Donati considered these rocks and islands as a continuation of the soil at the bottom of the sea surrounding them. The observations, made by him on these islands and rocks, when compared with those, which he made on the bodies taken up from the bottom of the sea, could not but afford great light with respect to the different objects of his inquiries.

He did not rest here, but examined, with the same view, the countries, which surround the seas above-mentioned. His excursions to the east of the
Adriatic

Adriatic Sea were very considerable, very fatiguing, and very dangerous. His passion for natural history, his particular inclination to botany, and the pleasure of pursuing his researches into countries before unknown to observers, made him resolutely surmount those difficulties.

His inquiries have enabled him to determine upon his own knowledge. that there is very little difference between the bottom of the Adriatic Sea and the surface of the neighbouring countries. There are at the bottom of the water, mountains, plains, vallies, and caverns, just as upon the land. The soil consists of different strata placed one upon another; and, for the most part, parallel and correspondent to those of the rocks, islands, and neighbouring continents. They contain stones of different sorts, minerals, metals, various petrified bodies, pumice-stone, lava's, formed by Volcanos.

Istria, Morlachia, Dalmatia, Albania, and some other adjacent countries, as well as the rocks, the islands, and the correspondent bottom of the Adriatic Sea, consist of a mass of a whitish marble, of an uniform grain, and of almost an equal hardness. It is that kind of marble called by the Italians *marmo di Rovigno*, and known to the antients by the name of *marmor Traguriense*.

This vast bed of marble, in many places under both the earth and the sea, is interrupted by several other kinds of marble, and covered by a great variety of bodies. There are discovered there, for instance, gravel, sand, and earths more or less fat.

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The variety of these soils under the sea is remarkable. It is to this, that Dr. Donati ascribes the varieties observed with respect to the nature and quantity of plants and animals found at the bottom of the sea. Some places are inhabited by a great number of different species of plants and animals; in others, only some particular species are found; and lastly, there are other places, in which neither plants nor animals are to be met with.

These observations not only point out to us the affinity and resemblance between the surface of the earth and the bottom of the sea; but may likewise contribute to discover to us one cause of the varieties, which are observed in the distribution of the marine fossils found in the earth.

Dr. Donati remarked in that vast mass of marble, which is common to the bottom of one part of the Adriatic Sea, and to the neighbouring provinces towards the east, a multitude of marine bodies petrified; some of which are so united to the stony substance, that they are scarce to be distinguished. He found in some places human bones petrified, which form one mass with a mixture of marble, red earth, and stalactites.

One of the objects, which most excited the attention of our author, was a crust, which he discovered under the water in divers places, and for a great extent. It is a composition of crustaceous and testaceous bodies and beds of polypes of different kinds, confusedly blended with earth, sand, and gravel.

These different marine bodies, which enter into the composition of this crust, are found at the depth

of a foot or more, intirely petrified and reduced into marble. At less than the depth of a foot they approach nearer to their natural state. And at the surface of this crust, they are either dead, though extremely well preserved, or still living.

This observation demonstrates, that stones or petrifications may be formed, and actually are formed, in great quantities under the water.

It is to be remarked, that these crustaceous and testaceous bodies and beds of polypes, mentioned above, are every-where mingled in the utmost confusion with each other: which shews a striking resemblance between the crust discovered at the bottom of the sea, and those of the marine bodies petrified, found in many parts under the earth, and especially in Italy. If these marine bodies petrified are naturally in that confusion in the sea; if they were born and die; and if they have been petrified in that state; it is highly probable, that those, which are found under-ground in the strata in such confusion, are likewise placed naturally in the same manner under the sea, when it covers them, and not by means of extraordinary events, such as volcanos and earthquakes, as has been conjectured.

The more these testaceous and crustaceous bodies and beds of polypes multiply, the more their exuvæ and skeletons contribute to enlarge this crust discovered at the bottom of the sea. Dr. Donati remarked, that in several parts it formed very considerable banks, and of a very great thickness.

It follows from hence, that the bottom of the sea is constantly rising higher and higher. Divers other causes contribute to it. Snow and rain-waters bring
down

down from the neighbouring mountains, into the sea, a great quantity of earth and stones. The waves, beating against the shores of the continent and islands, detach many masses, which are spread upon the bottom of the sea. The rivers carry the mud with their waters into the sea, at the bottom of which that mud deposits itself.

From the rising of the bottom of the sea, that of the level of the water naturally follows. Dr. Donati furnishes us with a great number of facts in proof of this. He observed, that at Venice, in Istria, and in Dalmatia, the level of the waters is several feet higher than it was formerly. This elevation of the waters is observed only on the northern and eastern coasts of the Adriatic. The sea seems, on the contrary, to abandon the western coast, that of Italy. This Dr. Donati has shewn by many very interesting facts.

He proceeds then to the observations, which he made upon the plants and animals of the Adriatic Sea.

He begins with some general reflections upon the nature of both. Upon this occasion he treats of the question concerning the resemblance between plants and animals, and in general of the chain, which these different organised bodies form by the affinity between them established by nature.

Dr. Donati, in mentioning the facts, which shew this imperceptible transition from the class of animals to that of plants, seems inclined to believe, that these facts are most frequently to be met with in the waters.

After having given a description of several very curious marine plants, he proceeds to the beds of polypes. He gives this name to all those organised bodies, known under the name of coralline bodies; and which were, for a long time, ranged under the class of plants. He then mentions different bodies, which he calls plant-animals, and animal-plants, according to the characters, which he found belonging to them, and which bring them more or less near to one or other of these general classes.

It would be too extensive a design to follow our author through all the curious details, which he gives upon this subject. Besides that an extract of that part of his work was read at a meeting of this Royal Society, and is printed in the 47th volume, p. 95. of the *Philosophical Transactions*.

Aleph ✕

Gimel <

Mem ii

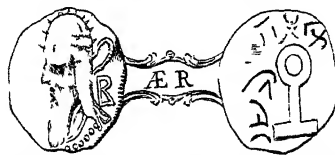
Lamed)

Ajin >

Schin vel Sin U

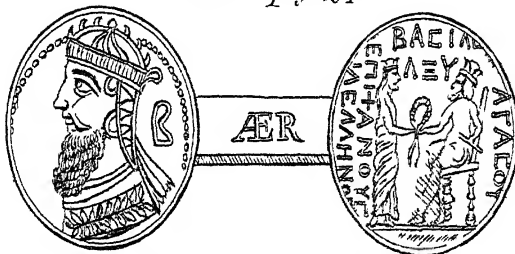
Jod)

Num. I. pag. 596 — 599.



Ap Ioan Swinton, A.M. Oxoniens. R.S.S.

Num. II. pag. 594.



In Gaza Ducis Devonienf.

Num. III. pag. 594 & 606.



In Scrin. Bodleian. Oxon.

LXXXIX. *A Dissertation upon a Parthian Coin, with Characters on the Reverse resembling those of the Palmyrenes. In a Letter from the Rev. John Swinton, M. A. of Christ-Church, Oxon. F. R. S. to the Rev. Thomas Birch, D. D. Secret. R. S.*

Reverend Sir,

Read April 8, 1756. **I** Met some years since with a small brass medal, in but indifferent conservation; which I have lately discovered, by comparing it with others, to be a Parthian coin. This medal, as I apprehend, exhibits the head of Vologeses III. adorned with a beard and a tiara, after the Parthian manner, together with a *Beta* behind it, that seems to point out to us the place in which it was struck. The reverse presents to our view a strange sort of instrument, or machine, which perhaps may be imagined to represent a key, besides some traces of characters in a great measure defaced, and, if I am not vastly mistaken, four intire Palmyrene letters. As I remember not to have seen any of the Palmyrene elements hitherto on antient coins, I hope I shall be indulged the liberty of submitting a few cursory remarks upon that now before me, which may be esteemed a real curiosity, to the consideration of our most learned and illustrious Society. Nor shall I make any other apology for these remarks, however jejune they may appear, than that here hinted at; especially, as the affinity between
the

the subject of them and those of my former letters, which the Society have done me the honour to publish in the last volume of the *Philosophical Transactions*, seems to render every thing of that kind altogether unnecessary.

1. That the medal here described ought to be ranked amongst the Parthian coins, is abundantly clear from a bare inspection of the draughts of several of those (1) coins. And that it was struck in the reign of Vologeses III. we may conclude at least extremely probable, from two similar Parthian coins, exhibiting the head of the same prince. One of these, which belongs to His Grace the Duke of Devonshire, has preserved on the reverse the following words, or rather parts of words (2), ΒΑCΙΑΕ ΑΓΑCΟΥ ΕΠΙΦΑΝΟΥC ΙΑΕΛΛΗΝΟC, together with the three Greek numeral letters ΑΞΥ; and the other, now in the possession of the University of Oxford, the very instrument, or machine, that occurs on the medal I am here endeavouring to explain, and a legend, consisting of strange characters, so injured by time as to be rendered thereby absolutely illegible. The Greek numerals ΑΞΥ indicate the piece, on which they appear, and not improbably that likewise now before me, as well as the other in the Bodleian cabinet, to have been coined in the 461st year of the Parthian æra, generally term-

(1) J. Foy Vaill. in *Asfacid. Imper.* p. 364, 366. Paris, 1728. *Numism. Antiqu. collect. a Thom. Pembroch. et Montis Gomer. Com. P. 2. T. 76.*

(2) Nicol. Fran. Haym Roman. *Del Tesor. Britan.* Vol. Second. p. 37. In Londra, 1720.

ed the æra of the Arsacidæ, (3) nearly coincident with the 205th of CHRIST, when Septimius Severus sat upon the imperial throne.

2. With regard to the *Beta* behind the head of Vologeses III. which is also visible on several other Parthian coins, I shall beg leave to remark, that it cannot well be considered as the initial letter of the word ΒΟΛΑΓΑΧΗC, or ΒΟΛΑΓΑΚΟΥ, the name of the prince in whose reign these medals were struck. For that very name originally occurred, as is evident from the part of it which still remains, on the reverse of the Duke of Devonshire's coin, with a publication of which the learned world has been obliged by Sig. Haym. It will therefore be readily acknowledged, by all who have been conversant in this branch of literature, that the *Beta* here was intended to represent the word ΒΟΛΑΓΑΚΙΑC, ΒΟΛΟΓΕΚΙΑC, ΒΟΛΑΓΑΚΙΑΔΟC, or ΒΟΛΟΓΕΚΙΑΔΟC, the name of the city where the piece was coined; at least this must be admitted, if we pay any regard to the au-

(3) My supputation here is founded upon the most received opinion, with regard to the commencement of the Parthian æra; which has been placed by Dr. Vaillant and M. L'Abbé de Longuerue, who are herein generally followed, in the year of Rome 498. It happened, however, about twenty-seven years later, according to Sig. Corfini, a gentleman of profound erudition, who at present makes a very considerable figure in the learned world. J. Foy Vaill. in *Arsacid. Imper.* p. 4. Parisiis, 1728. Ludovic. Du Four de Longuerue, Ab. S. Joan. de Jardo ad Melod. et Sept. Pont. in Therafc. in *Annal. Arsacidar.* p. 2, 3. Argentorati, 1732. Edvard. Corfin. Cl. Reg. Scholar. Piar. in Acad. Pisan. Humanior. Litterar. Profef. *De Minnisar. aliorumq; Armen. Reg. Num. et Arsacid. Epoch. Dissertat.* p. 13—29. Liburni, 1754.

thority

thority of Dr. Vaillant (4), one of the most celebrated antiquaries of the last age. Nor would it be difficult to produce a (5) sufficient number of similar initial letters, preserved on the anterior faces of ancient coins, in support of such an opinion.

3. As the imperfect characters, or rather traces of characters, on the reverse of my medal, have suffered so greatly from the injuries of time; I shall not take upon me to explain, at least with any degree of certainty, the words they originally formed. However, I hope I may be permitted to observe, that there appears no (6) inconsiderable resemblance between the first, second, and fifth of them, as it should seem, and the *Aleph*, *Gimel*, and *Mem* of the Palmyrenes. As for the confused indistinct sort of mark, that follows the second of these imperfect elements, it can by no means be considered in the light of an alphabetic character, but must have been occasioned by the ravages of time; as the protuberance raised by it above the field of the medal, and the remains of the letters near it, manifestly proves. If what is here advanced should meet with the approbation of the learned, it may perhaps be allowed, that the two first words impressed upon the posterior part of this coin were *אגדל מלך*, equivalent to the Hebrew *המלך הגדול*, ΒΑΣΙΛΕΥΣ ΜΕΓΑΣ,

(4) J. Foy Vaill. ubi sup. p. 321, 322, 365, 366. et alib.

(5) Vid. Hubertum Goltzium, in *Insular. Græc. Numism.* Tab. vii. Num. 7, 9. et Tab. viii. Num. 4. Wise, in *Nummor. Antiquar. Scrin. Bodlian. recondit. Catal.* p. 5. aliosque id genus Scriptor.

(6) *Philosop. Transact.* Vol. xlviii. p. 693, 740.

or Ο ΒΑΣΙΛΕΥΣ Ο ΜΕΓΑΣ, THE GREAT KING; which would answer with accuracy enough to the words ΒΑΣΙΛΕΩΣ (7) ΜΕΓΑΛΟΥ, exhibited by the reverses of several Parthian coins, with complete Greek legends upon them. Should the first letter be taken for an *Aleph*, the term to which it belongs would seem to be rather of the Arabic (8) than either the Hebrew, Chaldee, or Syriac form. Nor can it be conceived strange, if we suppose the piece to have been struck at Vologesia, though the Chaldee or Babylonian dialect must have chiefly (9) prevailed there, that this word should favour something of the Arabic form; as this city, according to (10) Stephanus, as well as Ptolemy, was seated near the Euphrates, at no great distance from

(7) *De Num. quibusd. Sam. et Phœn. &c. Dissert.* p. 53. Oxon. 1750. J. Foy Vaill. ubi sup. p. 145, 241. & alib.

(8) Val. Schind. *Lex. Pentaglot.* p. 1, 75.

(9) That the inhabitants of Vologesia enjoyed a flourishing and extensive commerce, when this piece was coined, seems to appear, not only from the situation of that city, which stood at no great distance from the confines of Persia, Arabia, and Mesopotamia, a country limited by the Euphrates on the side of Syria, but likewise from the tenth of Mr. Dawkins's Greek Palmyrene inscriptions. It may therefore be presumed, that Jews, Persians, or Parthians, Arabs, Syrians, and people of other nations, resorted thither, in considerable numbers, on account of trade. From whence we may conclude, that the vernacular tongue of the Vologesians was not improbably a mixture of Hebrew, Persian, or Parthian, Arabic, Chaldee, and Syriac. Hence it might come to pass, that the two first words of this legend were neither pure Hebrew, Arabic, Chaldee, nor Syriac; but received a tincture from most, if not every one, of those languages, or dialects. Dawk. *Inscript. Græc. Palmyren.* Inscript. x. Christ. Cellar. *Geograph. Antiq.* Lib. iii. c. xvi. *Philosoph. Transact.* Vol. xlviii. Tab. xxvii.

(10) Stephanus Byzant. *De Urbib.* Ptol. *Geogr.* Lib. v. c. 20.

the borders of Arabia, particularly that province of it going amongst the Orientals under the denomination of Najd. The conjectures here laid down, I say, upon supposition that I am not mistaken in the forms of these imperfect characters, may perhaps be considered by the learned as not altogether remote from truth. And this is all I desire, as I would have no greater stress laid upon them than what they will naturally bear.

4. But though I am not so sanguine in relation to the mutilated letters just touched upon, I cannot forbear declaring myself strongly inclined to believe, that the four last elements on the reverse of my coin are the very same with some of those that have been preserved by the two Roman Palmyrene inscriptions, and that copied by Mr. Maffon from Sig. Pietro della Valle's original papers; all which I have, in the last volume of the (11) *Philosophical Transactions*, endeavoured to explain. The form of the first of them, unless I am greatly deceived, answers exactly to that of the *Lamed* which occurs in the second of (12) the Roman Palmyrene inscriptions, and is but little different from that of the same element exhibited by the other. The second and fourth of them at (13) least approach extremely near to the figures of the *Ajin* and *Jod*, as they appear in both the Roman Palmyrene inscriptions. And that the third of them is of a form similar to that of the *Schin*, or *Sin*, presented to our view by Sig. Pietro della Valle's (14)

(11) *Philosoph. Transact.* Vol. xlviii. p. 732—757.

(12) *Philosoph. Transact.* Vol. xlviii. Tab. xxx.

(13) *Ibid.*

(14) *Ibid.*

inscription, seen afterwards by some English travellers at Teibe, as well as by the second Roman Palmyrene one, will, I persuade myself, scarce admit of any doubt. Now that the Greeks sometimes represented *Ajin*, and (15) particularly the Syriac *Ajin*, or *Æ*, by their *Gamma*, is very well known; and that the two powers of the *Ajin*, one of which was equivalent to that of G, are to this day acknowledged by the Arabs, who still express them by their letters *Ain* and *Gain*, the latter of which corresponds with G, is too (16) apparent to stand in need of any kind of proof. From whence we may conclude, that the elements I am now considering, together with the initial letter defaced by the injuries of time, and the vowels which they virtually contained, probably formed the word BOLOGASHI, BOLOGASI, BOLAGASI, or VOLOGESI, varying only in termination from the Greek ΒΟΛΑΓΑΚΟΥ, and the Latin VOLOGESIS; the former of which so frequently occurs upon the Parthian coins.

5. That I (5) was a Syriac, Chaldee, or Palmyrene termination of masculine proper names, seems sufficiently to appear from an inscription I have attempted to explain in one of (17) my former letters; and that this termination was sometimes converted into ΗΣ (ES) by the (18) Greeks, has been admitted by Hiller and Bochart, two authors extremely well ver-

(15) Boch. *Chan. Lib. II. cap. xii. p. 824.* Francofurti ad Moen. 1681.

(16) Vid. Erpen. *Gram. Arab.*

(17) *Philosoph. Transact.* Vol. xlviii. p. 732.

(18) Matth. Hiller. *Onomast. Sacr.* p. 671. Tübingæ, 1706.
Boch. *Phal. Lib. II. c. xix. p. 126.*

fed in oriental literature. From whence, without the least violence or torture, we may infer, that the word BOLOGASHI, BOLAGASI, or VOLOGESI, exhibited by the medal before me, the VOLOGESES of Tacitus (19), the ΒΟΥΛΟΓΑΙΣΗΣ of Dio (20), and the ΒΟΛΑΓΑΣΗΣ of the Parthian coins, may be considered as one and the same name. It must also be observed, that the Words VOLOGESUS and ΟΥΟΛΟΓΑΙΣΟΣ sometimes occur, as masculine proper names, in the antient (21) historians. But that these are not so consonant to the true and genuine manner of writing and pronouncing such proper names, may be clearly evinced from the words (22) ARSACES, TIRIDATES, MITHRIDATES, MNASKIRES, PHRAHATES, ORODES, GOTARZES, and others of the same kind, that might, with equal facility, be produced.

6. As the two Roman Palmyrene inscriptions, and that copied by Sig. Pietro della Valle at Teibe, if any regard be due to the preceding remarks, contribute not a little to the illustration of my coin; so this, in its turn, seems, in some measure at least, to support the authority of those inscriptions. For as several of the characters they all exhibit are extremely similar, or rather apparently the same; from thence we may collect, that the latter, as well as the former, of them are genuine and valuable remains of antiquity, and have hitherto been deservedly esteemed as such by the learned. Nay from thence it will

(21) Tacit. *Hist.* Lib. iv. c. 5. Dio, Lib. lxxiii. p. 719.

(22) J. Foy Vill. in *Asiad. Imper.* pass.

(19) Tacit. *Annal.* Lib. xii. p. 338. Parisiis, 1684.

(20) Dio, Lib. lxxv. p. 545.

farther follow, that the copies of the three above-mentioned inscriptions, published by Mr. Reland and F. Montfaucon, are not very inaccurately taken; and consequently that the elements they contain, though heretofore termed by me Palmyrene, on account of the resemblance between them and the letters inscribed on several of the stones found amongst the ruins of Tadmor, are not strictly of the same form with those that constituted, in certain intervals, the true (23) and proper alphabet of the Palmyrenes.

7. In conformity to the sentiment here laid down, it may be farther observed, that the first Roman Palmyrene inscription seems to have been drawn in some city of Syria, or Irâk, at a considerable distance from Tadmor, and to have been brought from that city to Rome. This opinion, notwithstanding what I formerly intimated, or rather (24) insinuated only, to the contrary, upon farther consideration of the matter, and since the discovery of the above-mentioned characters on the reverse of my Parthian coin, I find myself pretty strongly disposed to entertain. Such a notion is not only countenanced by the forms of the letters themselves, as they were cut in the stones, which have preserved them, about the same time that two of Mr. Dawkins's inscriptions were (25) drawn out at Tadmor, but likewise by the word ΠΑΛΜΥΡΗΝΟC, in the correspondent Greek inscription. For as all these bear nearly the same date,

(23) *Philosoph. Transact.* Vol. xlviii. p. 693.

(24) *Philosoph. Transact.* Vol. xlviii. p. 738, 739.

(25) *Ibid.* p. 738. Dawk. *Marm. Palmyren.* Inscript. Palmyren.
i. 8. iv, 9.

and yet the ducts of the letters they exhibit appear considerably different; it must be allowed, at least in some degree, probable, that they did not originally appertain to the same city: and had the monument, on which the local term ΠΑΛΜΥΡΗΝΟC is inscribed, been first erected at Tadmor, that term might perhaps have been deemed by some superfluous and unnecessary, not to say improper and absurd. With regard to the second Roman Palmyrene inscription, I must beg leave likewise to remark, that the forms of the elements it contains, which have suffered pretty much from the injuries of time, are not precisely the same with those of Mr. Dawkins's letters. From whence I should be induced to conclude, as it is void of a date, that it must either have been the produce of a different age; or, which may perhaps be deemed more probable, that the injuries of time have obliged several of the elements of which it is composed to recede something from their original forms. But, notwithstanding this, that it first appeared either at, or in the neighbourhood of, the city of Tadmor, we have all the reason in the world to believe. For as Tiberius Claudius, who was a foreigner, dedicated the altar, which it adorned, to *Malacbelus* and the other divinities of Tadmor, who (26) are therein treated as local deities; it had undoubtedly its situation at first either in that metropolis, or some other place in the territories of the Palmyrenes.

8. From the same inscription we may likewise infer, that the Calbites, therein-mentioned, performed

(26) *Philosoph. Transact.* Vol. xlviii. p. 756.

a vow they had made to *Malachbelus* and the other gods worshipped at Tadmor; and consequently that *Malachbelus* was the principal deity of the people to which they belonged, as well as of the Palmyrenes. This remark will shake at least, if it will not intirely overturn, the hypothesis proposed to the (27) learned world by Dr. Hyde, viz. that these Calbites were a part of the Kelbians, a (28) small inconsiderable canton seated at present on mount Libanus, and passed over in silence by the antients; who, according to this author, received the denomination of Kelbians from a black dog that they worshipped. Nor is this hypothesis confirmed, or even in the least countenanced, by either Mr. Maundrell, Dr. Shaw, or Dr. Pococke, who lately traversed that part of Syria where this obscure and contemptible clan have their habitations. In confirmation of the latter inference here deduced from this inscription, it appears (29) from the oriental writers, that the tribe of Hamyar, the antient progenitors of the Calbites, chiefly worshipped the sun; though they seem likewise, on certain occasions, to have paid divine honours to an idol named Nafr. The Calbites also, settled at Dawmat al Jandal, themselves adored the heavens, which bear a near relation to the sun, and might possibly have been mistaken by some of the aforesaid

(27) Tho. Hyd. *Hist. Relig. Veter. Persar. Append.* p. 491, 492. Oxon. 1700.

(28) D. R. Huntingt. *Epist.* p. 47. Lond. 1704.

(29) Al Zamakhshar. Al Beidawi, Al Jauhar. Al Shahrestân. Vid. etiam Poc. *Not. in Spec. Hist. Arab.* p. 93, 133, 134. & alib. See also Sale's *Prelim. Disc.* p. 17, 19.

writers for that planet, under the form of a man, and gave them the name of *Wadd*. This notion therefore of Dr. Hyde ought to be exploded as a fiction, advanced without any manner of foundation, and not meriting the attention of the learned.

9. That the four complete characters on the reverse of my medal vary something from the forms of the correspondent characters in Mr. Dawkins's Palmyrene inscriptions, is too obvious and apparent a truth to be denied. However, they may also be considered as letters of the Chaldee or Babylonian alphabet, with sufficient propriety, notwithstanding that variation. Nor can it be deemed matter of surprize, that such alphabetic characters should have been impressed on the reverse of this Parthian coin; especially, if it was struck at Vologesia, as there is undoubtedly room enough to suppose. For that this city was seated in Babylonia near the Euphrates, where the Chaldee or Babylonian alphabet prevailed, is abundantly manifest, from what has been already observed (30).

10. In support of what has been here advanced, it may be farther remarked, that the Palmyrene letters were not only used about the time of Vologeses III. in the Parthian territories bordering upon the frontiers of Syria, but likewise in the interior part of Persia itself. This most evidently appears from two inscriptions, in the Palmyrene language and character, with their correspondent Greek ones, still preserved at Nocturestand, Nocta-Rustam, or Naxi-Rustan, near those re-

mains of antiquity generally termed *the ruins of Persepolis*; which have been published both by (31) Sir John Chardin and Dr. Hyde, as well as in the 17th (32) volume of the *Philosophical Transactions*. The Palmyrene inscriptions have either been so inaccurately taken, or so injured by time, that only the two first words of them, *בין בר*, which in both appear the same, are legible. But these are sufficient, with the assistance of the Greek ones, that have not much better escaped, to point out to us both the language and the character in which they were originally drawn. For the Palmyrene terms are equivalent (33) to PERSPICVA SPECIES, CLARA SIMILITVDO, PVRA FIGVRA, THE APPARENT LIKENESS, THE CLEAR RESEMBLANCE, THE TRUE IMAGE, THE REAL MIEN or PORTRAIT; which by the correspondent Greek words, ΤΟΥΤΟ ΤΟ ΠΡΟσωΠΟΝ, the last of which in the first inscription has been miserably deformed, are, with tolerable justice and propriety, expressed. The Greek letters, APZA CIAΩCBACIAΞΩN, in the first inscription, clearly present to our view, in Parthian Greek,

(31) *Voyages de Monsieur Le Chevalier Chardin, en Perse, &c.* Tome Troisième, p. 119. A. Amsterdam, 1711. Hyd. Rel. Vet. Pers. Hist. Append. p. 518, 519. See also *Voyages de Corn. le Bruyn*, Tom. iv. p. 361.

(32) *Philosoph. Transact.* Vol. xvii. n. 201. p. 775, 776.

(33) Val. Schind. *Lex Pentaglot.* p. 238, 983. Edm. Cast. *Lex. Heptaglot.* p. 422, 2014.

such as sometimes occurs upon the (34) Parthian coins, the words ΑΡΣΑΚΟΥ ΒΑΣΙΛΕΩΣ ΒΑΣΙΛΕΩΝ, *i. e.* ARSACIS REGIS REGUM, OF ARSACES THE KING OF KINGS; and consequently give us sufficiently to understand, as they are inscribed on the breast of a horse of stone, cut out of the mountain of black marble at Naxi-Rustan, or, as others say, on the garment of his rider, that they belonged to an equestrian statue of one of the Parthian kings. Now the *Omega* of the minuscular form, always exhibited here, was never visible on the Parthian coins before the reign of Monnefes, which a little preceded that of Vologeses III. if the draughts of those coins given us (35) by Dr. Vaillant may be depended upon. Hence we may conclude, that the Palmyrene inscriptions now before us were probably coeval with Monnefes and Vologeses III. and consequently that the Palmyrene alphabetic characters were used at Estakhr, a very antient and considerable city (36) of Fârs, or Persia properly so called, almost contiguous to the aforesaid ruins, that is, in the interior part of Persia itself, about the very time when the piece I am now offering my thoughts upon was coined.

11. From what has been here observed, some of the learned may perhaps be induced to suppose, that the aforesaid stupendous remains of antiquity

(34) J. Foy Vaill. in *Arsacid. Imper.* p. 347.

(35) J. Foy Vaill. *Arsacid. Imper.*

(36) Ifm. Abu'lfed. apud Gol. in *Not. ad Alfragan.* p. 113. ut et ipse Gol. ibid. Nâsir Al Tûfi & Ulugh Beik, in *Tabul. Longit. & Latit. Civitat.* Ed. Hudf. Oxon. 1711.

cannot so properly be deemed the ruins of Persepolis, as those of another city of a later date. For the above-mentioned inscriptions seem evidently to prove, that those ruins belonged to a very superb and magnificent place, which either served for a residence to several of the lower Parthian kings, or at least was greatly favoured, and on certain remarkable occasions visited, by them. Now the ancient city of Estakhr, which some (37) take to be the same with Persepolis, though this cannot be strictly true, as that place is allowed to have been destroyed (38) by Alexander the Great, made a considerable figure even after the Parthian (39) times, and extended, without doubt, to the spot occupied by the aforesaid ruins, going at present under the appellation of Shelmanâr, (40) or Shahelmanâr. Nay Estakhr, according to the (41) Persian historians, was the capital of Fârs, or, as they call it, Pârs, that is, Persia, till the royal seat was transferred from thence to Al Madâyen upon the Tigris (42), built by Shabûr, surnamed Dhu'laktâf, or Sapor III. of the house of Sasan, after the Parthian monarchy was dissolved; and

(37) Golii *Not. ad Alfragan.* ubi sup. D'Herbel. *Biblioth. orient.* art. *Esfekhar*, p. 327.

(38) Plutarch. in *Alexand.* Q. Curt. Lib. v. Arrian. Lib. iii. Diod. Sic. Lib. xvii. Justin. Lib. xi.

(39) Gol. & D'Herbel. ubi sup. Greg. Abu'l Faraj, in *Hist. Dynast.* p. 183. Mirkhond, apud Teixeira. p. 324. En Amberses, 1610.

(40) Golii *Not. ad Alfragan.* p. 113.

(41) D'Herbel ubi sup.

(42) Idem ibid.

consequently it must have been, even if we follow them, the principal residence of Monnefes and Vologeses III. as they (43) make the Ashkanians, Ashganians, or Arfacidæ, to have formed the preceding dynasty of the antient Persian kings. This seems to be confirmed, and even rendered incontestable, by the inscriptions just touched upon. The authority therefore of those writers, thus supported, cannot be impugned by the modern geographers, in the point before us; when they assert, perhaps without the least shadow of rational proof, that the city of (44) Al Madâyen was in reality no other than the Ctesiphon of the antients.

12. That the second Roman Palmyrene inscription, whose age cannot be determined with any precision, is nevertheless inferior in point of antiquity to the third of those published by Mr. Dawkins, the forms of the letters themselves (45), preserved on the stones that exhibit them, which so greatly resemble the characters appearing on my Parthian coin, seem manifestly to prove. As the third of Mr. Dawkins's Palmyrene inscriptions must therefore be looked upon as a very valuable acquisition to the learned world, I shall here beg leave to propose to the consideration of the Royal Society a new interpretation of the first part of this inscription; though it be not very different from that

(43) Khondemir, Al Emîr Yahya Ebn Abd'ollatîf Al Kazwîni, in *Lebtârikh*, D'Herbel. ubi sup. p. 135.

(44) D'Herbel. *Biblioth. orient.* art. *Madain*, p. 525.

(45) *Philosoph. Transact.* Vol. xlviii. Tab. xxiv. xxx.

which I have already had the honour to submit to the superior judgment of the most learned and illustrious body. I imagine then, that the mutilated term **ברו ::** (46) might have been originally either **זברו**, DEDERUNT, DONAVERUNT, or **עברו**, PARAVERUNT, DEDICAVERT, &c. the latter of which words occurs, in the same sense, on a Palmyrene marble, exhibiting an inscription that I have formerly (47) attempted to explain. If this be admitted, the two first lines must be translated into Latin (48) thus: DONUM HOC est ATQUE ARA QUÆ DEDERUNT (PARAVERUNT, vel DEDICAVERT) OMRIBOL-SHEMESH (AMRIO'L-SHAMS, vel AMRI AL SHAMS) ET ZEBIDA; and into English thus—: THIS IS THE GIFT AND ALTAR WHICH OMRIBOL SHEMESH (AMRIO'L SHAMS, or AMRI AL SHAMS) AND ZEBIDA GAVE (or DEDICATED.) But whether we adopt these new translations, or acquiesce in those formerly given, we cannot, as I apprehend, be very remote from truth; since I make not the least doubt, but all of them are perfectly consonant to the genuine sense and tenor of the inscription.

13. The term **רב**, RAB, likewise, in the fifth line of Mr. Dawkins's fifth Palmyrene inscription, may perhaps be supposed by some to admit there of

(46) Line 3d.

(47) *Philosoph. Transact.* Vol. xlviii. p. 732.

(48) Vid. Val. Schind. *Lex. Pentaglot.* p. 460, 1256. Hanoviz,

a signification, a little different from that which I have assigned it, in one of my former letters. It may possibly be presumed to denote AN OFFICER, or MILITARY TRIBUNE, PRÆFECTUS MILITÆ, vel TRIBUNUS MILITARIS; that being one of the (49) Syriac acceptations of this word. But as the term CTPATIΩTHC, or rather CTPATIΩTHC ΛΕΓ...., in the correspondent Greek inscription, manifestly implies, that the person who erected the statue, in honour of SEPTIMIUS ÆRANES, was a common soldier, or legionary, such as the PILANI were; as this implication seems confirmed by the Palmyrene words ררי פלרנא, MILES EMERITUS, A VETERAN, or VETERAN SOLDIER; and as the mutilated Greek term ΠΑΤΡΩΝ.. apparently denotes this person to have been inferior, in point of station, to the senator SEPTIMIUS ÆRANES; my former versions of Mr. Dawkins's fifth Palmyrene inscription will, I am inclined to flatter myself, be allowed to stand. However, I submit them, as well as every thing here advanced, with the utmost deference, to the determination of the learned.

14. With regard to the last mentioned inscription, I must beg leave farther to remark, that the month *Ti/ri*, in which it first appeared, answers to *Hyperberetæus*; which may be considered either as a Macedonian or a Syro-Macedonian month. This is clearly deducible from Mr. Dawkins's

(49) Edm. Castell. *Lex. Heptaglot.* p. 3493. Lond. 1669.

sixth Palmyrene inscription, and the fragments of the Greek one, with which it did originally correspond. Hence we may infer, that the Palmyrenes had only one month denominated *Tisri*; though the Syrians, or Syro-Chaldeans, applied to two of their months that name. This farther points out to us the conformity between the Palmyrenes and the Jews, who likewise called only one month *Tisri*, with respect to the names of some of their months; which, in two of my former letters, I have already (50) hinted at. As therefore the Jewish *Tisri* and the Macedonian *Hyperberetæus* nearly coincided with the month of *September*, the same may perhaps likewise be said of the *Tisri* of the Palmyrenes. Farther, as the æra of Seleucus, according to the best (51) chronologers, commenced on the first of *October*, our inscription must have been drawn, if the learned should admit what has been suggested here, in the 252d year of CHRIST; but if, with the Syro-Macedonians, we make *Hyperberetæus* and *October* the same month, the preceding year. However, the above-mentioned conformity between the Jews and the Palmyrenes seems to render something more probable the former opinion.

15. The Palmyrene letters forming the last word of Mr. Dawkins's tenth inscription may also perhaps, at first sight, be imagined to correspond with the Chaldee or Hebrew elements constituting the word

(50) *Philosop. Transact.* Vol. xlviii. p. 703, 731.

(51) Gul. Revereg. *Institut. Chronologicar.* p. 237. Londini, 1721. Prid. *Connex.* Par. I. B. viii. p. 539, 540. Lond. 1720. Jo. Albert. Fabric. *Menolog.* p. 16, 43, 45. Hamturgi, 1712.

כסל, CISLEU, the name of one of the (52) Hebrew months. But, upon a very slight examination, it will be found, that such a notion must be in some measure invalidated by the Palmyrene *Lamed*, than which nothing can be more visible in Mr. Dawkins's copy of this inscription, at the end of that word. I have therefore supposed the Palmyrene name of the month here mentioned to have been PELLUL, or PELELUL, an apparent depravation, or corruption, of the correspondent Greek ΑΠΕΛΛΑΙΩ, the Macedonian name of this month. Nor can I at present think any thing, since that name answers so well to the Palmyrene letters, as they appear upon the face of the inscription, more just and natural than such a supposition.

16. However, as the first Palmyrene letter in this word seems rather more to resemble *Caph* than *Pe*, as all the other names of months in the Palmyrene characters are Jewish, and as the Macedonian *Apellæus* corresponded with the Jewish *Cisleu*; some of the learned may perhaps be thereby induced to believe, that the true lection is CISLEU, notwithstanding what is intimated to the contrary here. If this be admitted, it must be allowed extremely probable, that the last letter, which is apparently *Lamed*, was owing either to the inattention of the copier, or the inaccuracy of the inscriber; or else that it was accidentally added to the other elements, after the inscription first appeared. Upon any of which suppositions, we may read the

Palmyrene word *CISLEU*; and consequently assert *Apellæus* to have been amongst the Palmyrenes (53) a Macedonian, not a Syro-Macedonian, month, as the Macedonian *Apellæus* only answered to the Jewish *Cisleu*. From whence we may infer, that the other names of months, which occur in the Greek Palmyrene inscriptions, point out to us Macedonian months; and therefore, that the very learned Cardinal (54) Noris is not to be followed, when he seems to declare himself in favour of the contrary opinion.

17. Before I dismiss the subject I am now upon, it may not be improper to observe, that the two Palmyrene alphabets, lately discovered, will probably enable the learned to decipher various obscure legends, on the reverses of Parthian coins, with which the cabinets of the great and the curious are adorned, consisting of characters hitherto termed *unknown*, and such as were antiently used either at Tadmor, or other places at no vast distance from that once most opulent and flourishing city. However, that several of those coins have preserved legends drawn up in a character receding something more from that of the Palmyrenes than the letters exhibited by the medal I have been considering, there is not the least reason to doubt; one of them appearing in my small collection, struck, as I apprehend, in the

(53) Jo. Albert. Fabric. *Menslog.* p. 16, 42. Hamburgi, 1712. Euvard. Corfin. *Past. Attic.* p. 450. Florentiæ, 1747.

(54) F. Hen. Noris Veronens. *De Epoch. Syromaced.* p. 124. Lipsiæ, 1696.

reign of Monnefes, never hitherto published, with fuch a legend, and a correſpondent Greek one, upon it. Nay this is fufficiently manifeſt from the Parthian coin now in the Bodleian cabinet, of which I herewith ſend you a draught, that may be intirely depended upon; though the elements it originally bore have been ſo effaced by time, that the powers of them will probably, even by the moſt ſagacious inquirer, never be diſcovered. Nor ſhould I be ſurprized to meet hereafter with medals coined in the principal cities of the Parthian empire, and particularly at Vologeſia, with Greek and Palmyrene letters, as well as Greek and the other ſort of elements, upon them; ſince all ſuch different kinds of alphabetic characters may naturally enough be ſuppoſed to have been uſed in thoſe cities. For that a ſimilar practice prevailed at Tyre and Sidon, where coins were not ſeldom ſtruck, that exhibited both Greek (55) and Phœnician legends, is a point too well known to be controverted amongſt the learned. And that an intercourse was kept up, and an extenſive commerce carried on, between the citizens or Tadmor, whether Greeks, Syrians, or Romans, and the inhabitants of Vologeſia, and therefore probably thoſe of all the moſt eminent Parthian towns, is indifputably clear from one of the Greek Palmyrene inſcriptions (56), which aſſerts this in very ſtrong terms. Other arguments of great weight might be offered, in

(55) T. Foy Vaill. in *Seleucidar. Imper.* paſſ. Vid. etiam Erann I celich, in *Annal. Compenaiar. Reg. & Rer. Syr.* paſſ. Vennæ Auftriæ, 1744.

(56) *Philofoph. Tranſact.* Vol. xlviii. Tab. xxvii. Inſcript. x.

support of what is here advanced, which the limits of this paper oblige me at present to supersede. I shall therefore only beg leave to assure you that I am, with all due sentiments of respect and esteem,

Sir,

Christ-Church, Oxon.
Nov^r. 27th, 1755.

Your most obliged,

and most obedient,

humble Servant,

John Swinton.

XC. *A Catalogue of the Fifty Plants from Chelsea Garden, presented to the Royal Society, by the worshipful Company of Apothecaries, for the Year 1755, pursuant to the Direction of Sir Hans Sloane, Baronet, Med. Reg. & Soc. Reg. nuper Præses, by John Wilmer, M. D. clariss. Societatis, Pharmaceut. Lond. Socius, Hort. Chelf. Præfectus & Prælector Botan.*

Read April 29, 1651
1756.

A Bsinthium maritimum Lavendulæ foliis. C. B. P.
139.

1652 Achillea foliis pinnatis, planis, inciso-ferratis, extimis majoribus. Linn. Sp. Plant. 898.

4 H 2

Ptarmica

Ptarmica Alpina matricariæ folio Triumf.
83.

1653 *Amethystea*. Hort. Upsal. 9. *Amethystina montana erecta foliis exiguis digitatis trifidis ferratis flosculis cum coma e cœruleo ianthinis*. Amman. Ruth. 54.

1654 *Anonis purpurea verna seu præcox, perennis, frutescens, flore rubro amplo*. Mor. Hist.
2. 170.

Cicer arboreum Indicum perenne. Zanon. 66.

1655 *Apocynum Americanum scandens, Vincæ pervincæ foliis subincanum*. Par. Bat.

1656 *Aquilegia pumila præcox Canadensis Cornuti*.

1657 *Atropa foliis sinuato-angulatis calycibus clausis acutangulis*. Linn. Sp. Plant. 181.

Alkekengi amplo flore violaceo. Feuillei per
724. T. 16.

1658 *Buglossum Lusitanicum Echii folio undulato*.
Tourn. Inst. R. H. 134.

1659 *Buglossum Lusitanicum foliis asperis oblongis, angustioribus et crispis*. Inst. R. H.

1660 *Cannacorus flore coccineo splendente*. Tourn.
Canna Americana flore fulgenti coccineo splendente. Hort. Lugd. Bat.

1661 *Ceanothus foliis trinervis*. Lin. Sp. Plant. 195.
Celastrus inermis foliis ovatis, ferratis, racemis ex summis alis longissimis. Linn. Hort.
Cliff.

1662 *Centaurea calycibus ciliatis spinosis foliis bipinnatifidis*. Linn. Sp. Plant. 918.

Jacea lutea sexta. Tabernamontan. Hist. 436.

1663 *Chelidonium majus, foliis et flore minutissime laciniatis*. H. R. Par. 49.

- 1664 *Cirsium Acanthoides montanum* flore flavescente. Tourn.
- 1665 *Clematis cœrulea* vel *purpurea repens*. C. B. P. 300.
- 1666 *Cliffortia foliis dentatis mas.* Hort. Cliff. 463.
Camphorata Capensis, *Eryngii minoris folio*.
Petiver Hort. 243.
- 1667 *Cnicus foliis cordatis*, *petiolis crispis*, *spinosis*,
amplexicaulibus, *floribus cernuis*. Hort. Upsal. 251.
Carduus foliis ex cordato-lanceolatis, *marginem ferratis*, *et spinosis*, *sq̃amis calycum membranaceis laceris fœnosis*, *capitulis nutantibus*. Flor. Sibi ic. 2. p. 47. Tab 19.
- 1668 *Convulvulus foliis sagittatis postice truncatis pedunculis bifloris*. Flor. Leyd. Prod. 427.
Convulvulus Syriacus seu Scammoniaca Syriaca. Mor. Hist. p. 2. 12.
- 1669 *Corona Solis foliis asseris tribus vel quaternis ad genicula fitis*. Hist. Ox. 3. 24.
- 1670 *Crocus Alpinus autumnalis*. C. B. P. 65.
Crocus montanus autumnalis. J. B.
- 1671 *Cytiso-genista Lusitanica*, *magno flore*. Tourn.
- 1672 *Cytisus floribus capitatis*, *ramis decumbentibus*.
Fl. Leyd. prod 376.
Cytisus supinus foliis infra et filiquis molli lanugine pubescentibus. C. B. P. 390.
- 1673 *Cytisus glaber nigricans*. C. B. P. 390.
Cytisus Gesneri, *cui flores fere spicati*. J. B. 1. 370.
- 1674 *Digitalis angustifolia flore ferrugineo*. C. B. P. 244.

- 1675 *Doria* quæ *Jacobæa Africana*, *hederæ terrestris*
folio repens. Hort. Amst. 2. 145.
- 1676 *Ferrum equinum* filiqua multiplici. C. B. P.
349.
- 1677 *Helxine* foliis lanceolatis, caule diffuso. H.
Upfal. 96.
Fagopyrum Orientale ramosum et multiflorum,
perficaricæ folio. Tourn. Cor.
- 1678 *Hieracium* caule ramoso, foliis firmis, infimis
petiolatis, reliquis ex ovato-lanceolatis semi-
amplexicaulibus, omnibus sinuosis, petio-
lorum instar dentatis. Fl. Siberic. 2. 26.
Tab. 10.
- 1679 *Horminum Verbenæ* laciniis angustifolium.
Triumfett.
- 1680 *Limonium peregrinum* foliis *Asplenii*. C. B. P.
192.
Statice foliis caulinis decurrentibus. Hort.
Cliff. 116.
- 1681 *Lupinus* floribus cœruleis inodoris, in spicas
longas digestis, radice reptatrice. Gronov.
Flor. Virginic.
- 1682 *Milium Arundinaceum* subrotundo semine,
fargo nominatum. C. B. P. 26.
Melica five sorghum. Dod. p. 508.
- 1683 *Nicotiana* foliis cordatis, floribus paniculatis,
tubis clavatis. Linn. Sp. Pl. 180.
Nicotiana folio cordiformi tubo floris præ-
longo. Feuill. Per. p. 714. Tab. 10.
- 1684 *Nicotiana* foliis cordatis, corollis racemosis sub-
ringentibus, calycibus inæqualibus. Lin. Sp.
Pl. 181.
- 1685 *Oxys bulbosa Æthiopica* minor, folio cordato
flore

- flore ex albido purpurascēte. Hort. Amst.
1. 48.
- 1686 *Prunella bracteīs pinnato-dentatis ciliatis*. Læfl.
Def. 31.
Bugula odorata Lusitanica. Cornut. Canad.
46.
- 1687 *Quamoclit Americana folio hederæ, flore coc-
cineo*. Commelin. Rar. 21.
*Convolvulus Americanus folio anguloso, flore
parvo coccineo*.
- 1688 *Ranunculus montanus folio gramineo*. C. B. P.
180.
Ranunculus pumilus gramineis foliis. J. B. 3.
866.
- 1689 *Ranunculus vernus rotundifolius minor*. Tourn.
286.
Chelidonium minus. Offic. Ger. 1669.
- 1690 *Ruscus angustifolius, fructu summis ramulis
innascente*. Tourn. 79.
*Laurus Alexandrina, ramosa fructu e summi-
tate caulium prodeunte*. H. R. Par.
- 1691 *Ruta muraria*. C. B. P. 356.
Salvia vitæ. Lobel.
- 1692 *Ruta sylvestris minor*. C. B. P. 336.
- 1693 *Satureia capitulis terminalibus, foliis lanceo-
latis*. Linn. Sp. Pl. 567.
Satureia Virginiana. Herm. Par. 218.
*Clinopodium foliis lanceolatis acuminatis, ca-
pitulis terminalibus*. Hort. Cliff. 304.
- 1694 *Senecio Madraspatanus Rapifolio, floribus
maximis, cujus radix nonnullis China dicitur*.
Musæum Petiver. N°. 680. Hort. Eltham.
Tab. 258. fig. 335.

- 1695 Siliquastrum flore purpureo. Cast. Durant. 415.
Arbor Judæ. Dod. 786.
- 1696 Sifon foliis ternatis. Hort. Cliff. 99. Fl. Virg.
147.
Myrrhis Canadensis trilobata. Mor. Hist. p. 3.
301.
- 1697 Spartium alterum monospermum semine reni
simili. C. B. P. 396.
- 1698 Tetragonia foliis linearibus. Flor. Leyd.
Tetragonocarpos Africana fruticans, foliis
longis et angustis. Hort. Amst. 2. 205.
- 1699 Tetragonia foliis ovatis. Flor. Leyd.
Tetragonocarpos Africana radice magna, crassa
et carnosâ. Hort. Amst. 203.
- 1700 Tithymalus Orientalis, falicis folio, caule pur-
pureo, flore magno. T. Cor. 2.

XCI. *Extract of a Letter from Dr. Vita-
liano Donati, Professor of Botany at Tu-
rin, to Mr. Abraham Trembley, F. R. S.
concerning the Earthquakes felt at Turin,
December 9, 1755, and March 8, 1756.
Translated from the Italian.*

S I R,

Turin, March 20, 1756.

Read April 29, 1756. **T**HE cause of Earthquakes is un-
known to me. You know those
mentioned by natural philosophers. It seems to me,
that they are not sufficient for explaining all the
phænomena. The antients have observed, that
earthquakes were accompanied with some particular
meteor,

meteor, and some remarkable alteration in the air. Such alterations have been observed at the time of the late earthquakes. Who knows, whether an electrical force be not capable of moving above a quarter of our globe? I have communicated this notion to father Beccaria, and I found him almost intirely convinced of it.

I did not feel the earthquake of the 1st of November last. I was then on the road going from Milan to Vercell. There was in the air something harsh, which incommoded me in a particular manner. The wind was south, and not strong. There was no cloud in the sky; but, from early in the morning to the evening, the air, especially to the south, was, as it were, charged with dust. About two hours before sun-set, I observed the clouds, which formed a band, which extended from the south to the west, and even farther. These clouds, at first, appeared not very thick, and a little raised above the Mountains. After sun-set they appeared very thick, white, and near the surface of the earth.

I was informed afterwards, that on the same day, about half an hour after eleven in the morning, there was felt at Milan an earthquake. The iron rods, upon which hung the chandeliers of the church of Dome, and those of other churches, received an oscillatory motion, which they kept for a long time. The waters of canals and lakes rose above their banks, like the water in vessels put into motion. No noise was heard in the houses, nor was any shock perceived.

This earthquake, of the 1st of November, was not felt at Turin. A thermometer of Mons. de Reaumur was, at seven in the morning, at 6 degrees

and a quarter above the freezing point, and at two in the afternoon at 7 degrees. The barometer was at seven in the morning at 27 deg. 7 min. and at two in the afternoon at 26 deg. 11 min. and a half. The wind was west, and it rained.

On the 9th of December, at half an hour after two in the afternoon, a shock of an earthquake was felt here at Turin; but not a considerable one, so that a great number of persons did not perceive it. For my own part I felt it very sensibly, being then in the University-pulpit raised very high. The chair, on which I sat, was thrown by the shock from one side of the pulpit to the other, in the direction of south to north. Upon feeling the motion of the earth, I immediately lifted up my feet, in order that I might the more easily be carried with the chair by the motion. This shock lasted between 4 and 6 seconds. Some minutes after came another shock, but it was extremely slight. Its direction was likewise from south to north. I judged so, because the chair, on which I was sitting, rubbed with some noise against the side of the pulpit, against which it had been carried by the preceding shock. This side of the pulpit was towards the north. The second shock lasted about two seconds. My employments did not permit me that day to observe the sky with attention. I observed, that the air was obscure. The wind was west. The barometer at two in the afternoon was at 27 deg. 7 min. and the thermometer at 3 degrees above the freezing point.

I have been informed from Milan, that about the same hour, and on the same day, a shock of an earthquake had been felt. The waters did not rise, and yet a
good

good deal of motion was taken notice of in those of the lakes. For three days the waters rose from underground in the lower apartments of the houses situated near the east gate. The springs, which water the lands in the country, became more copious.

On the 28th of December at six o'clock, according to the Italian way of reckoning, a slight earthquake was felt at Padua.

On the 8th of March, at half an hour after eleven in the morning, in the French way of reckoning, as I was reading at my table in an apartment situated in the third story very high, as you know, I felt two shocks directed from above downwards, but they were very slight.

Some time before I had taken the precaution to observe in a more sensible manner the earthquakes, which might happen.

I had fastened to an iron bar, fixed in a very thick wall, a brass wire disposed into a spiral line, at the extremity of which hung a leaden bullet of about a pound weight. I made use of a spiral wire in order that I might the more easily remark the least motion, which should happen from above downwards. It hangs near the table, on which I write. When the two shocks, which I have mentioned, happened on the 8th of March, I saw distinctly the leaden bullet at the end of the brass wire rise and fall at different times. There was six minutes after another slight shock, which gave the wire an oscillatory motion from south to north. The wind was then south. The thermometer was in the morning, at half an hour after seven, at 5 degrees and a half above the freezing point, and at two in the afternoon at 10 degrees.

The barometer was in the morning at 27 deg. 7 min. and in the afternoon at 27 and a half. The air was a little clouded and sharp. I was in the evening at Valentin *. I observed, that an hour before sun-set, there was a little above the mountains a great band of clouds, which contracted and lengthened themselves more and more. It began in the south, passed through the west, and extended almost to the north.

I have written to Padua, and Venice, and into Dalmatia and the East, to be informed what may have been observed there. If I shall receive any account, I shall take care to communicate it to you.

CII. *An Account of a continued Succession of Earthquakes at Brigue in Valais. Written by the Rector of the College of Jesuits at Brigue, and addressed to Monsr. Jalabert, Professor of Philosophy and Mathematics at Geneva, and F. R. S. and communicated by Mr. Abraham Trembley, F. R. S. Translated from the Latin.*

Read April 29, 1756. **V**ALAIS, and especially Brigue, have almost every ten years felt Earthquakes, but never any so considerable as in 1755. For in that year, on the 1st of November, which was so

* A palace of the king of Sardinia, without the walls of Turin, where the Botanical Garden is.

fatal to Portugal, we felt Brigue several times shaken, and particularly on that very day. And, what is wonderful, from that time, especially in the night, the walls were perceived by many persons to tremble; for which reason they justly apprehended still greater shocks of an Earthquake. On the 9th of December, which was a clear day without wind, about two in the afternoon, the earth at first made a great noise, and seemed, as it were, to give a signal for immediately retiring. This was, not long after, followed by repeated, but slight motions. At a quarter after two, the earth was again shaken, and a much louder noise heard: at last, a little before half an hour after two, all Valais seemed upon the point of destruction; for the earth began not only to tremble, but to send forth a horrible noise, and to shake all the buildings with so violent a motion in the space of two *pater nosters*, that the houses inclined on each side alternately, and rocked like a cradle: almost all the chimnies were thrown down; all the churches suffered very great damage; the towers gaped; a considerable number of walls fell down; and stones of all sizes poured down from all the buildings, so that no house at Brigue escaped some injury. It was a singular instance of the goodness of God, that when all the inhabitants fled amidst the dreadful showers of stones falling every where, not one of them was hurt.

The whole neighbourhood suffered the same calamity, especially Glisa and Natria. In the latter, the roof of the parish church fell at the same moment; and at Glisa, the large church, and especially the tower, were greatly damaged. For a great part of the wall of the tower being removed out of its place,

place, fell on the roof of the church, and broke it, and demolished the side altar under it.

At Brigue both the church and college of the Jesuits suffered very considerably. Part of the roof of the former fell down; and all the walls of the college were much cracked.

It was likewise observed by some persons then in the fields, that in some places the earth opened and immediately closed again; and that water rose from the ground like a *jet d'eau* several feet high: which I ascribe to the secret springs in the earth. Some fountains likewise in the neighbourhood, which had run till then, have ceased ever since; and, on the other hand, not a few never seen before have flowed from that time.

At the distance of about an hour's journey from Brigue there is a mountain, where it has been observed from the 9th of December to the 26th of February, that every day within the twenty-four hours the ground sinks in, the space of a thumb's breadth: and every body is persuaded, that there is water lying there; but the event must shew, whether any great quantity, or capable of doing mischief, or only some harmless springs.

With regard to that dreadful 9th of December, almost every half hour the shocks of the earthquake returned, but without damage; the earth seeming to tremble continually under our feet, and as it were to groan. From the 9th of December to the 21st the shocks were repeated every day, but still fewer and less violent. On the 21st, at four in the morning, Brigue was so much shaken, that every body was justly frightened: but no damage was done except the falling down of some stoves.

From

From the 21st to the 27th we felt the earth moved twice or thrice every day at different times. On the 27th, at half an hour after two in the afternoon, Brigue suffered a shock almost equal to that on the 9th, but of a shorter duration, and attended with scarce any damage. On the 28th, in the morning, about six, there were two slighter motions. The 29th was the first day free from all disturbance. On the 30th, at one in the night, the houses were greatly shaken, so that some chimnies, which had been before damaged, now fell. On the 31st there was no disturbance.

On the 2^d of January, 1756, at half an hour after nine at night, there was a slight shock. On the 3^d, a little before ten in the morning, there was another gentle one; but none till the 6th, before eight at night, when a pretty considerable shock happened. On the 7th, about five in the evening, were two more, as also on the 8th at half an hour after eight at night. For the three following days all things were quiet. On the 11th, at three in the morning, and again about eight, and on the 12th and 13th, were some few shocks, but slight. On the 14th, at half an hour after two in the morning (which time proved generally fatal) every thing was put into such an agitation, as is inexpressible; but the damage was but small, because the motion lasted scarce three or four seconds. On the 15th, at half an hour after five in the morning, there was a slight shock. It is observable, that on this day, and generally for three or four hours before the earthquake, we observed a gentle trembling to precede, and the winds, which were before violent, to subside of a sudden: and that

the motion seemed always to be propagated from the South to the North. It is fact, that all the books in our library, tho' of a square form, were all thrown down from the south towards the north. I observed the same in the chasms of the ground, which were near parallel with the meridian. I often remarked likewise, that the Rhone grew turbid a little before the earthquakes; and I frequently took notice in the evening after sun-set very long clouds stretched out like a strait line, without any breadth, and extended from the South to the North. The earth, in some places, was broken into fissures, but not large ones.

On the 16th and 17th of January all was quiet. On the 18th, at twelve at night, there was a moderate shock, but of a short continuance. On the 19th, at three quarters after twelve, there was another moderate shock. The 20th was undisturbed. On the 21st, at eleven in the morning, and the 22d, a little before eleven at night, the earth was shaken so violently, that every body confessed, that this shock was very near equal to that of the 9th of December; but the damage done was small. This was soon followed by another, but more gentle. On the 23d, in the morning, were two more shocks, the first stronger than the second. On the 24th some slighter ones: on the 25th more frequent ones, but without much noise: the twenty sixth was as the day preceding, as likewise the 27th, except that some stones fell down here and there. And from that time the motions have grown weaker and less frequent, and even none for one or two days. On the 6th of February, at six in the morning, there was a very great shock; and from that day to the 13th every day a continual tremor

tremor of the earth, but no shock. On the 14th, at night, there was a slight motion. On the 15th the earth was twice greatly shaken at half an hour after two, and half an hour after five. The 16th was quiet; and the 17th perfectly so. On the 18th, at half an hour after one, was a terrible shock with a great noise, which continued for the space of a *pater noster*, and ended with a violent shaking. On the 19th, at half an hour after eleven in the morning, the walls were again so violently shaken, that the stones, and what was upon the walls, fell down. For some days after all was quiet. On the 23d there was a very gentle motion; and on the 26th two, but both slight.

I shall now subjoin the other particulars, which seem to me to deserve to be mentioned.

1. No person has lost his life, tho' many were in manifest danger of it.
2. The accounts, which have been published in the news-papers of Geneva concerning Brigue, are not at all true; for all the churches are standing: and it is false, that the earth has opened vast chasms, and that a thick and fetid matter flowed from these chasms.
3. The damage, which the neighbourhood has suffered, far exceeds that, which was occasioned a little before by the inundations. Some of the buildings cannot be inhabited without danger.
4. Whatever is not found in this account may be judged to be false.
5. We perceive still some slight tremor of the earth, but it daily decreases.
6. Tho' in the more remote parts of Valais the same motions were felt, and at the same time, yet the neighbourhood of Brigue was much more sensible of them. Brigue is surrounded with very high moun-

tains, and stands on a hill, Glifa and Natria, the former of which is at a quarter of an hour's distance from Brigue, and the latter at half an hour's, are situated almost on a plain. Glifa suffered more than Brigue. Lastly, Brigue never had in any year more violent winds than in 1755; and we are continually infested by the south wind.

These are the facts, which I have hitherto remarked with care: if any thing remarkable shall occur hereafter, I will not fail to write them to you.

Brigue, 27 Feb. 1756.

CIII. *Extract of a Letter of Mons. la Condamine, F. R. S. to Dr. Maty, F. R. S. translated from the French.*

Rome, 11 March, 1756.

Read May 6, 1756. **T**HE Abbé Barthelemi, who is here, has been at Naples. In the manner of going on with the manuscripts there, it will require above a century to open and pass them all. However it is done with great dexterity. But there is only one person employed in it. The Canonico Mazzocchi, who copies them, is very capable of that task. An academy of Antiquaries is just founded at Naples, for explaining all the antiquities dug up at Herculaneum; but according to their method of discussing things in their assemblies, they will not explain two dozen antiquities in a year. They will alter their method, and find, that such kinds of works, and perhaps all others, are not to be done

by a company. The Abbé Barthelemi has read very well a page, except a few words, which he had not time to study. The account of the manuscript on music is true.

The measures of the Abbé de la Caille, and those of Father Maire and Father Boscovich, whose book must now be in the hands of the Royal Society, do not agree with the elliptical curve of the meridian, or with the circularity of the parallels. And the earthquakes felt on the same day on all the coasts of Europe, and in Africa and America, at Ancona, Morocco, Boston, and in the Baltic, may contribute to convince those, who shall doubt of it, that the earth has immense cavities, and that it is very heterogeneous, or rather of a very unequal density. Consequently its figure is a little irregular; or, if the curvature be such, as the laws of statics seem to require in the hypothesis of homogeneity, that figure must be altered by changes happening in the internal parts of the mass. It was at first supposed to be spherical, and the orbits of the planets were considered as circular. It was afterwards found, that they were elliptical, and the earth an ellipsoid. Every step made in the study of natural philosophy has discovered some apparent irregularity, according to our manner of conception. The refractions, the aberration of light, the nutation of the axis of the earth, have all been reduced to a calculation. Afterwards was found out the irregularity of the refractions upon small eminences, which perplex astronomers. The heterogeneity of our globe will puzzle the mathematicians; and earthquakes will perhaps do so more than all the rest. I have probably observed to you before, that

I am convinced, that Italy was a chain of volcanos, of which we know only some of the links. I have found lavas exactly like that of Vesuvius in the whole way from Florence to Naples, and in places, where there was not any suspicion of volcanos. All the lakes of Italy, which I have seen hitherto, exhibit traces, not to say evidences, of this.

I begin to think, that the whole earth is perhaps in the same case with its surface, and was thrown into the utmost disorder at some period of time, of which no remembrance has been preserved. Lazzaro Moro, a Venetian, has gone much farther than I do: all the mountains, isles, and continents arose, according to him, from the bottom of the sea, by means of subterraneous fires. I never heard of his opinion till after I had formed my own conjecture, or rather verified the fact in part of the Apennine, which I have passed through. I have had time only to run over the titles of his chapters.

CIV. *Observations upon the Currents of the Sea, at the Antilles of America: By Dr. Peyssonnel, F. R. S.*

Read May 6, 1756. **T**HE coasts of these American islands are subject to counter-tides, or extraordinary currents, which render it very dangerous to chaloupes and other small craft to land; whilst, at the same time, the boats and ships in the roads are scarce ever sensible of them, and seldom incommoded by

by them ; nor do those, which are out at sea, appear to be affected by them. It is however, certain, that a regular wind constantly blows, in these parts of the of the torrid zone, from the tropic of cancer, to the equinoctial line, from the east ; inclining sometimes northward and sometimes southward. This wind is called * Alizé, for reasons admitted by philosophers, and drives the waters westward, giving a total and uniform course to that immense quantity, which comes from the great river of the Amazons, and from an infinite number of other rivers, which discharge themselves into the ocean. These currents passing to the westward, go up to the American islands, then to the coasts of Jucatan and Mexico, and running round in the gulph, return into the great ocean, by the straits of Bahama, along the coasts of Florida, in order to pursue, in the north, the course ordained them by the Supreme Being. It is in this course the waters are known to run with an extraordinary rapidity ; they pass between the great and little islands of America, in the great deeps, by an almost even and imperceptible motion ; but against the shores and coasts of these islands, which form this archipelago, these currents are very sensible and dangerous ; they interrupt the navigation, insomuch that it is scarce possible to stem these tides to get to the eastward. I remember that in 1711, being in the bay of la Guade, a point to the west of Portorico, it was impossible for us to get up to the town of St. John de Portorico, whither we were conduct-

* Trade Winds.

ing the bishop of that town, whom we took on board at the Havanna in the island of Cuba: we spent thirty days in making thirty leagues; the night was calm, and then we lost what we had gained by day; and whether we made long or short tacks, the currents drove us to the westward. It often happens, that vessels steering from St. Domingo, or the other Leeward Islands, to the Windward ones, cannot absolutely accomplish it, and are therefore obliged to get out of the channel, and steer away to the northward, in order to tack up to the Windward Isles. These are daily observations, and well known to all navigators of America.

Besides these regular currents, there are others, which are called counter-tides, which are observable upon the sea-coasts and shores. In places, where these flow, the sea rises in an extraordinary manner, becoming very furious without any apparent cause, and without being moved by any wind; the waves rise and open very high, and break against the shore, with such violence, that it is impossible for vessels to land.

It is observable, that these sorts of tides, which sometimes last several days, and at other times spend their violence in twenty-four hours, are more frequent in what they call the bad season, which is from the month of July to November, than at any other time of the year: and that, in these months, tempests and hurricanes happen, which throw down and destroy the houses, buildings and plantations of these colonies. I have gone through several of these tempests or hurricanes; the first in 1712, when I was at sea, along the coast of the island of Clerave or Bouriquen, to the
the

the south east of Portorico ; the others in the island of Guadaloupe and the Grande Terre. The most furious were those, which happened August 29, 1738, and the 8th of September, 1740, of which I can speak to my own knowledge ; and perhaps it may not be disagreeable to hear a description of them, which will lead me to my system, or at least to support my conjectures of the cause of these sea-currents.

Hurricanes are foreseen by a calm, and a frequent shifting of breezes from all points ; the setting sun of a blood-red ; little clouds moving with great rapidity ; the sea-birds, called frigates, and many other kinds, quit the air, and seek the shore. By these signs, together with the season, in which these happen, the hurricanes are expected ; proper precautions are then taken to avoid the fury of the winds ; the houses are propped, the windows and doors are barred up, and papers and other valuable moveables are secured in chests.

Soon after, a north breeze springs up, which comes to the north-east, and from south to south-east ; the air is darkened by one continued thick cloud, which increases the horrors of the night ; for it often happens, that these tempests come in the night, and continue all the next day. In the last hurricane, I saw the wind stood at north-east, and blew with such violence, that the largest trees were torn up by the roots, their trunks broken to pieces ; nor was there a leaf left upon those other trees, which yielded to the fury of the winds ; the houses were thrown down, and the tops of the sugar-mills, which are conical, and less susceptible of being thrown down, were crushed
to

to pieces; scarce any thing remained standing upon the ground. These furious winds were accompanied with a violent rain, which resembled the mist made by the agitation of waves, or like waters kept up by the wind. The tempest lasts till day-light, and sometimes continues pretty far in the day. In that in 1740, towards eight o'clock in the morning, it grew suddenly calm for a quarter of an hour, and then returned again blowing from the south, with such violence, that the buildings and trees, which were destroyed by the north wind before, were blown about, and moved by the first blast of that from the south. The hurricanes were followed by so many particular and surprising phenomena, which were almost incredible, that I dare not report them: however, a philosopher, who is acquainted with the force and power of confined air and its elasticity, might admit them to be true. At the end of these, there appears lightening, and we can hear the noise of thunder: these are the signs of the tempest's being at an end; for the wind softens gradually, and all becomes quiet.

After these hurricanes the forests appeared only like a parcel of ship-masts or poles standing; all the trees being stript of their leaves, and their branches broken off made a dreadful appearance, especially in these countries, where a perpetual verdure adorns the trees and fields. Every one was employed in repairing his losses, and mending the dismal remains of the frightful wreck.

In 1743, two years after the great hurricane, we had a storm less violent than the two former. I happened

pened to be from home; and, when the violence of it was over, I turned out to return to my house, to repair such losses as I expected to have sustained; and, in my road, I came upon a rising ground from whence I viewed the island of Guadaloupe, being then upon the Grande Terre of this island.

I observed, that the storm, which had affected us in the night, was now very violent upon the island of Guadaloupe: it was a frightful, thick, black cloud, and seemed on fire, and gravitating towards the earth: it occupied a space of about five or six leagues in front; and above it the air was clear, there appearing only a kind of mist.

I then knew, that, in order to be agitated with the whole force of a hurricane, it must be found in the very body of a cloud; that is, we commonly find the effects by the impressions made on us, whether by winds, rains, lightening, or thunder, from it. It is from the elements in it these effects are produced, where the wind or air is compressed, and rolling upon itself, causes the storms, which overthrow every-thing. He is unhappy, who happens to be in the stream of this fluid; for the most solid buildings tumble down; whilst the villages of little huts of the negroes stand unhurt; because they are not met by the current of wind. Judge what must be the violence of these hurricanes, when a piece of timber of a mill thirty-two inches square by thirteen feet long, which might weigh eight or ten thousand pounds, was thrown several paces from its place by one of these hurricanes.

It is in the clouds these elements, water, air, and fire, produce their effects. The water is, as it were,

suspended by the wind, and fiery places appear in them, which are neither lightening, *ignis fatuus*, nor *phoscorus*; nor does the hurricane end, till the cloud bursts, and the lightening and thunder come on; nor do the impressions made by the mixture and strife of all these elements blended together, cease till then.

This episode, far from leading me from my subject, which regards the cause of currents and counter-tides, is what naturally brings me to it. These clouds, bearing downwards from on high upon the surface, form a kind of solid, which compresses the water perpendicularly, and forces it against the bottom. This impulse, made against the solid earth below, acts chiefly upon the shores according to this motion; then the sea is subject to two impressions, one upon the surface from the storm that agitates it, and the other from the weight and total pressure of the cloud that lies over it: this causes the waters to circulate at the bottom, giving them a particular motion along the coasts, which is not perceivable at a certain distance from them. According to the direction of the storm, whether east, west, north, or south, of an island; and according to whatever point of the island presents to the impulse of the wind, the waters separate, their motion is now in two directions, the current is observed to go on one side of the island to the east, on the other, to the north; and, on the contrary, the one to the west, and the other to the south; and that depends upon the position of the island, according as it resists the total motion of the waters at the bottom of the sea. Nor have these counter-tides any regular or determined course,

I observed, that, whenever we had storms or hurricanes at Guadaloupe, the counter-tides were very violent at Martinico and the neighbouring islands; and even in the road of St. Pierre the vessels, that were moored too near the shore, were dashed to pieces: and in 1750, when the island of St. Eustace was so ruined by a dreadful hurricane coming in a contrary course, on the 1st of November, we had here the most violent counter-tides.

This is the description of one of the most extraordinary phenomena; and, I think, it is the greatest counter-tide, that has been heard of. On the third of July, 1746, a very strong current, or counter-tide, was observed to the windward of this island, Grande Terre, Guadaloupe, which came from the island of La Desirade; that is, from the east. It was first perceived about the mole; the waves broke in, sinking some of the palisadoes of the houses, and tumbling others down; but its greatest violence appeared about eight leagues from that along the steep coast; for from the mole, the shore is a strait precipice of above two hundred feet high. The sea was so dreadful, that it rose up, and threw sand over the precipice upon the plain. I never could have believed it possible, if I had not seen it myself, when I was some months after at the Caribbees, which are along this coast to the northward of this island, Grande Terre, Guadaloupe, in places where the sea, driven by the common winds, is always in agitation. This coast, where the savages have a retiring place, is formed by such precipices of two or three hundred feet high, and being so plumb steep, is a frightful sight, which way soever it is viewed. Above

the precipices the sea looks like a deep abyſs; the rocks eſcape the ſight below; and, when viewed from below, theſe precipices ſeem to be in the clouds, and their tops over-head look, as if they would fall upon, and crush one to pieces every moment. The dread of the earth's ſinking terrifies thoſe above; and the fear and apprehenſion of the rocks tumbling upon one frights thoſe below; and yet, notwithſtanding all that, the ſavages go aſhore in theſe places, leaving their barks in little creeks, which they find below; and climb theſe precipices, where goats and kids can ſcarce keep their footing; and that with an incredible courage and dexterity.

The place in the Caribbees we went to ſee was agreeable enough, though wild and deſert. We could not ſee from thence La Deſirade, St. Dominique, Guadaloupe, and Les Saints; our view extended over the land of this iſland, which was very low; and the ſea to the northward preſented to us the Engliſh iſlands Montſerrat, Antigua, Nevis, &c. The trade wind reſreſhed the air; and ſome trees defended us from the rays of the ſun. It was here we beheld what was almoſt incomprehenſible; and what I never could have believed, if I had not ſeen it. We found a vaſt quantity of ſand thrown up by the ſea from the counter tide, of which I am treating: The ſea was ſo agitated, and was raiſed ſo high, that it paſſed over the bounds, that God had ſet it in this iſland. 1. The waves roſe along this coaſt to two hundred and forty feet high, bringing with them the ſand mentioned. 2. The current continuing its courſe and violence tore away the largeſt trees by the roots along the coaſts, and threw up a prodigious quantity.

quantity of madrepores. In the more low places, towards Port Louis, Pointe d'Antique, it run more than a thousand paces within land. Here I must stop, not daring to declare the end of this tide, for fear of being disbelieved; because I do not myself comprehend how what I saw could happen nor imagine the cause. What I am to tell you shews good sense and reason, although it is the real truth.

It must be observed, that there is a grand bay or gulph in this place formed by the point called Dan-tique Isle Grandterre, and the point of the old fort Isle Guadaloupe, and by the little island called Cahouane; these two points are seven or eight leagues distance from each other; the bay being much of the same length, extends inwards as many leagues to the salt river, or natural canal of sea-water, which separates the two islands. There are several small islands in the middle of this gulph; and the coasts all round are very low. Between Lance Bertrand and Port Louis, there is a marsh made by the rain waters, which are confined there by a bank of stones and sand, which separates the lake from the sea; and the waters of the marsh naturally run towards Port Louis, and partly towards the Pointe d'Antique: so that if Port Louis is not lower, it is at least upon the level.

The waters of the counter tide forced this bar or sand-bank into the marsh, and rushed up to the main land, near two thousand paces from the sea-shore: they must have risen at least ten or twelve feet above the surface of the sea. The natural course of these waters was therefore to descend towards Port Louis; but this was not the case: these same waters, which
were

were so violently driven by the counter tide, instead of passing out by the natural common way, rushed back upon themselves, and returned into the sea, by the same road they had formed for their entrance; and not a drop of these waters passed to Port Louis. This Pointe d'Antique was always the *ne plus ultra* of the counter tide, as well by sea as by land. I was at five o'clock that afternoon in the town of Port Louis, and we could perceive no manner of alteration in the sea. They informed us of the terrible havock made by the counter tide, above the Pointe d'Antique, about a thousand or fifteen hundred paces from the town. I ran away towards the place, but was stopped by the waters, and trees that were torn up, which blocked up the way. The more I consider this phenomenon upon these places, the less I understand it. The counter tide having finished its course, and produced these effects, the waters were driven to the islands in the middle of the bay, and they were covered with the overflowing waters for several days. After all this, let mankind endeavour to find a reason for these effects of nature. These are the observations, which, joined to many others, may lead to a general system for explaining the currents of the sea.

Observations upon certain Currents in the Mediterranean Sea.

If the knowledge of the flux and reflux of tides is of so much importance to navigation, an acquaintance with the currents will appear of no less consequence. There are currents known to be so rapid,
that

that, notwithstanding the wind, they are not to be stemmed; such as the channel of Bahama in Florida, and some others. But there is no certain regulation for those other currents, which happen in the straits along the coasts, and even at sea. There are scarce any means found out to observe them; nor have there as yet been any researches made after the causes; nor indeed have any applied themselves to observe their exact variations. I do not doubt, but that great advances wou'd be made in the knowledge of the subject, if a considerable number of observations were collected, and compared together; and that the coming of those currents, and even their duration might be foreseen. The following is what I have observed, which I produce in order to be joined to such as may be made hereafter.

Observations made at Bizerty, in Barbary, in the year 1724.

In the voyage I made into Barbary by the king's order, I was at Bizerty, formerly called Hippozaritos: this town is situated on the northern coast of Barbary, in the kingdom of Tunis, within four leagues west of the gulph of Carthage, bearing north and south with Cape Carbonaire in the island of Sardinia, and in 37 degrees 18 minutes north latitude.

Before this little town the sea forms a small gulph, being about a league north and south, by three leagues east and west. The town was built at the end of this gulph, upon a canal, which ends in a large pond or lake, which extends southward and westward; three leagues long and as many broad. At the end of this
there

there is a second canal, upon which the town called Thimida was formerly built: this canal is about a quarter of a league long, and communicates with a second pond something less than the former. I cannot find a reason why (according to Mons. De Lisle, in the chart for the consideration of the council), this pond should be called *Lacus Dulcis*; for they both are salt water notwithstanding, and nourish a great quantity of sea-fish; such, among others, as the mullet, the roe of which they call, when it is dry, by the name of *coutarque* *.

I had heard, that there were considerable currents in these lakes; and when we arrived at Bizerty, I saw the waters run out of the lake with so extraordinary a rapidity, that I took it for a river: but, upon reflecting what was told me, I observed, that the wind was then at E. N. E. that the waters ran out for eight days with this wind; and the lake sunk a foot and half by the observations I made on one of the piers of the bridge upon this canal. The wind then changed, and came about to the west, and the water returned with the same rapidity that it had run out before. I even perceived on the bank, or fence, made by the reeds, that the waters of the sea were four inches higher than those of the lake; and rose while the westerly wind blew. Some days after the winds shifted; and I saw on the same

* Dr. Shaw (in his travels, pag. 155.) describes the lake of Tunis; and says, it is famous for affording a fine prospect; receiving no small beauty from the many flocks of the Flamant, or Phœnicopterus, that frequent it: and that it is no less famous for its large Sweet Mulletts; the roe of these dried is a delicacy, and called *Botargo*.

day, the waters pass in, and out, according as the wind blew east or west.

The inhabitants assured me, that this phenomenon never happened but sometimes in winter; and that the rain-water runs out of the lake, when it is full, even though the wind be west. Now it may be concluded from these observations, that the winds contribute very much to the currents of the Mediterranean Sea; since they appear to be the efficient cause of those I have described.

Observations at Marseilles.

It is observed regularly at the port of Marseilles, that, when the winds are to the south-west, the waters are up; that is, that the waters rise considerably upon the shore, and the quay of the port: and that, when they are to the north-west, the waters, on the contrary, are very low. This second daily observation concurs with the former to prove, that the winds may be the cause of the currents.

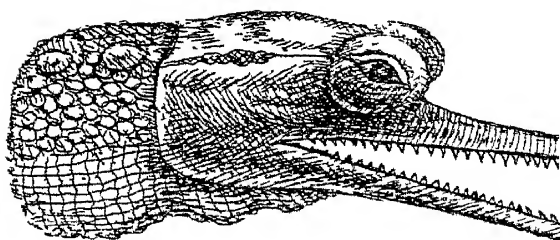
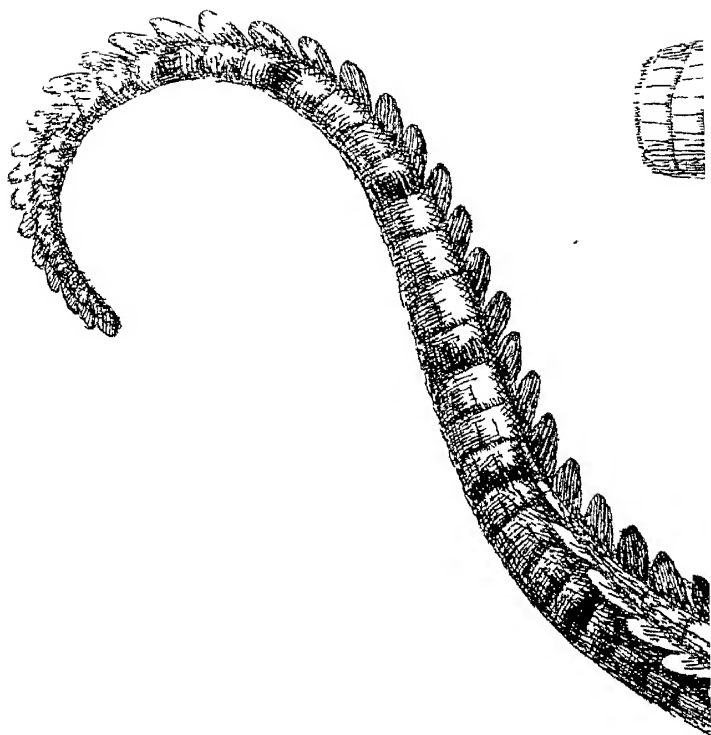
But as common matters are passed over with contempt, frequent observations, which may be very quick, are neglected, and people are more ready to attend to what is more singular; such as the extraordinary flow, that happened at the port of Marseilles, on the 29th of June, 1725, when the waters rose over the quay, and into the shops; and as suddenly retired. The philosophers of that place mention it. But I did not see it myself; but I shall describe an inundation very like this, which happened at Bonne in Barbary, which I saw, on the fourth of the same month, and the same year.

*Observations at Bonne (called also Hipone) in
Barbary.*

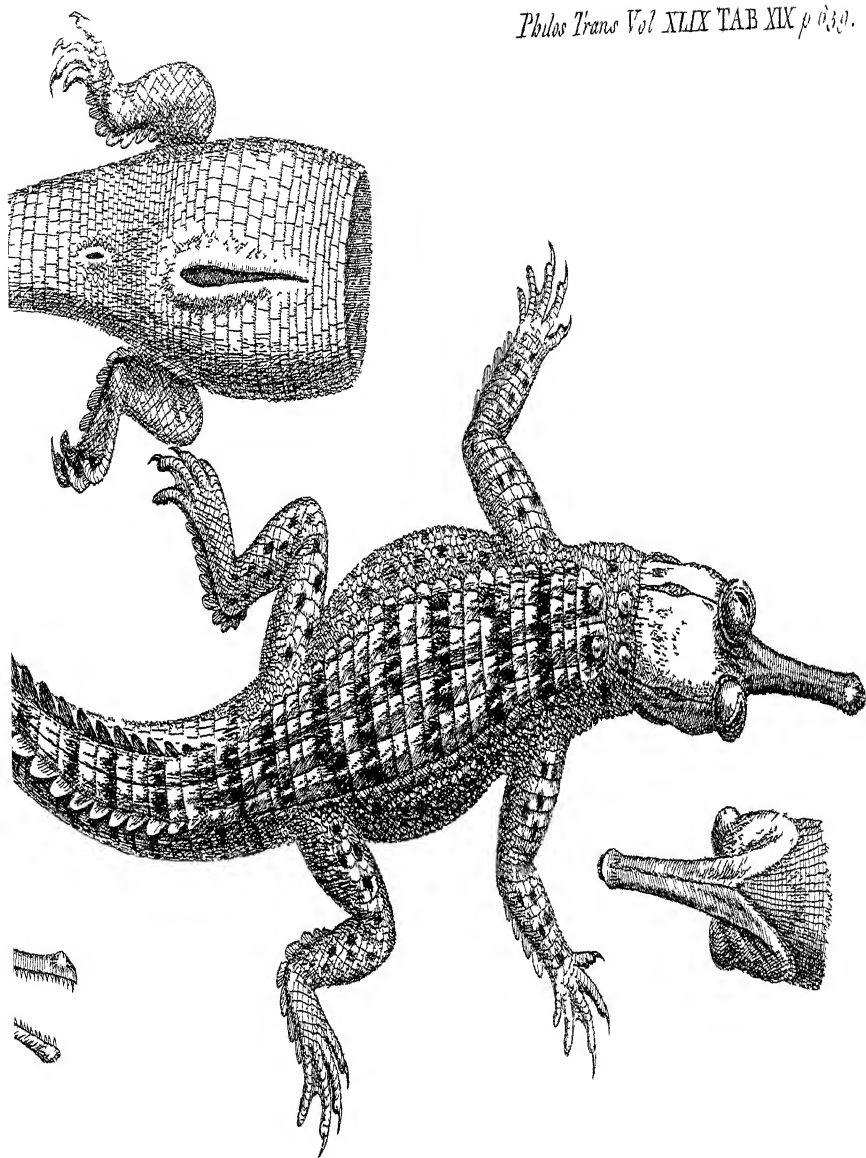
On that day, the weather was very changeable; it rained in the afternoon; and the wind came to the South-west: at eleven o'clock at night it became calm, and the sea was quiet. I was upon the terras of the India company's house half an hour before sun-set; and we observed, that the waters were very high; when all on a sudden an extraordinary current happened; and, in less than a minute, the sea-waters retired swiftly, and sunk ten feet and upwards; the sea-shore became dry more than two hundred paces from its common mark, leaving the fish upon dry land, numbers of which were taken up; and among others a kind of raii, which weighed thirty pounds.

Three minutes after, the waters entered again with the same rapidity, with which they ran out; and I observed even till night, that those irregular motions of the sea diminished by degrees; and that, about every two minutes, the waters went in and out alternately, losing their motion insensibly, like those undulations made by agitating a vessel of water, which gradually become less by turns.

My reflections upon these observations would be unnecessary. I should however add here, what the coral-fishers told me, and made me observe, on holding the cord of the machine, which they cast into the sea for fishing. They observe, that there are often currents upon the water, which carry their boats to one side; whilst at the bottom of the sea, there is a contrary current to that upon the surface; and that, if they are not expert in making proper remarks, they often
lose



The narrow



Beak'd Crocodile of the Ganges, with an Open-belly. *Geo Edwards delin*
A. Kneller sculp 1798

lose their fishing ; casting their nets to little purpose, which being carried away by the current, do not fall where they intend for finding the coral.

XCV. *An Account of Lacerta (Crocodylus) ventre marsupio donato, faucibus Mer-ganseris rostrum æmulantibus. By Mr. George Edwards, Librarian to the College of Physicians.*

Read May 6, 1756. **T**HREE of these Crocodiles were sent over from Bengal about ten years ago to the late Dr. Mead, physician in ordinary to the King ; two of which he preserved in his own collection, and presented the third to the late curious Mrs. Kennon ; and since the decease of these eminently worthy persons, they are all become the property of Mr. James Leman, of London, who has obliged me with the use of one of them to produce, together with this account, to the inspection of the Royal Society ; which is the subject here laid before you ; and of which I present the Society with a figure, just of the size and form it appeared in, when taken out of the spirits (Tab. xxix.). I suppose this not to have been many days excluded from its egg, when taken. My reason for this conjecture is, because the nails or claws on the outer toes do not yet appear ; which, I suppose, may be inconvenient, or at least useless, while it is inclosed in the egg ; which, by its struggles, might tear its membranous covering before

the proper time of its exclusion. A young allegator or crocodile from North America, here laid before you by way of comparison, has part of its nails wanting on its toes, just as the above described wants them ; though in a large dried allegator, now in the college of physicians, all the toes are armed with strong claws. What is most extraordinary in this species, and distinguishes it from all other crocodiles, is the narrowness of the beak or chaps, which appears like the bill of the bird, which we call a goosander (merganse). It has small sharp teeth, of which I shall say no more, as I have given three very exact views of the head and beak. Another particularity is a pouch or open purse in the middle of the under side of the belly, which seems to be naturally formed, with round lips and a hollow within, perhaps to receive its young in times of danger ; as we find it in an American animal call an opossum. As I have no pretensions to the knowledge of anatomy, I asked the favour of my obliging and curious friend Dr. Parsons, of the Royal Society, to assist me, who, according to my request examined it, and gave it as his opinion, that the opening in the belly was really natural, it having no appearance of having been cut or torn open. In other respects it hath all the marks common to allegators and crocodiles ; viz. a particular strong square scalliness on the back, which in the young ones appear distinct and regular, but in the older ones lose their distinct form, and become knobbed and rough, like the bark of an old tree ; and in having small, round, and oval scales on their sides, which in the young ones are no bigger than
rape

rape seeds; and the belly is scaled, to appearance, a little like the laying of bricks in a building. It has fins on the out-sides of its fore and hinder legs, as other crocodiles have. It has also a great distinguishing mark of the crocodile kind, viz. two rows of fins on the upper-side of the tail, which begin insensibly small at the setting on of the tail, and increase gradually as they advance toward the middle of the tail, where they become one row, and so continue to the end; the tail is roundish at its beginning, but from the middle, where the two rows of fins become one, it is flat like an oar. The four feet have each of them five toes; the hinder feet have only four, which is also a mark of the crocodile; all the lesser lizards, that I have observed, having five toes on each of their hinder feet. In the fore and hinder feet, the third and fourth toes only are webbed together. The eyes are very prominent, and seem to be contrived, that they may be carried above the water, while the rest of the animal is wholly under water, in order, as I suppose to watch its prey on the surface of the water, or on the banks and shores of rivers. The head is covered with several large scales. The beak is finely creased transversely, as the engraving in the figure sheweth. As I have been very exact in my figure, which was worked on the copper plate immediately from nature by my own hand, and in several different views, it will express more than can easily be conveyed by words. It appeared in the spirits all over of a yellowish olive colour, the under-side lighter than the upper; the upper side having some dusky marks and spots, as represented in the print. I do not know, that this species hath yet
been

been figured or taken notice of by any author ; which is to me a wonder, since our India Company have been so long settled at Bengal : and this I have reason to believe, when at full growth, to be near, if not quite, as big as the common crocodile.

College of Physicians,
London, May 6, 1756.

XCVI. An Account of an unusual Agitation of the Sea, at Ildfarcombe, in Devonshire, Feb. 27, 1756. By the Rev. Mr. Prince, of Barnstable : Communicated by the Rev. Jeremiah Milles, D.D. F. R. S.

Read May 13,
1756.

ON Friday, the 27th day of February last, at six in the evening, the weather being then extremely fair, as it had been for some time before, and continued for some days afterwards, the sea being exceedingly calm, a rumbling noise was heard, like that, which usually precedes what the sailors call a ground-sea, only it was much louder. The tide, at that time, was above half ebb, and retired as far as the head of the key, leaving the vessels, within the pier, on dry ground : when on a sudden the sea came on with a great run, filling the quay to the height of six feet perpendicular ; and the water remained at the same height near half an hour, but was all the time agitated as in a storm. By this means all the vessels were afloat ; some broke loose from their moorings, and on the recess of the waters were likely to be carried out to sea. The consternation, which this occasioned, gave

no leisure for accurate observation, nor could any one inform me of the exact distance from the time of the first swell till the waters rose to the height of six feet, some speaking of four, others of five or or six minutes.

It is to be observed, that the like phenomenon happened on the 1st of November last, and the waters then rose to the same perpendicular height.

XCVII. *Extract of a Letter from the Rev. Mr. Holdsworth, at Dartmouth, relating to the Agitation of the Waters observed there on the 1st of November, 1755. Communicated by the Rev. Jeremiah Milles, D. D. F. R. S.*

Read May 13, 1756. **I** Have enquired particularly of our pilot-men, and others concerning the tides in this harbour, who unanimously, agree that there was a surprizing agitation in the waters about nine in the morning on the first day of November last, when there was a great and sudden swell; and though there was but little wind, yet the boats, riding near the mouth of the river, tumbled and tossed as if they would have leaped into each other; and two of them broke loose from their moorings. During this fermentation (or boiling of the sea like a pot, as my informant expresses himself) though it was four hours ebb, the waters rose as high, or higher than they usually do on the highest spring tide. This
violent

violent motion lasted about three quarters of an hour, and then the waters fell to their usual height at that time of the tide, and have continued to flow and ebb ever since without any perceivable alteration. I am,

Reverend Sir,

Dartmouth, April 30,
1756.

Your most obedient servant,

Henry Holdsworth.

It appears by this account, that the agitation of the waters observed at Ilfarcombe, on the 27th of February last, was not perceived on the southern coast of Devonshire.

XCVIII. An Account of a Method of observing the wonderful Configurations of the smallest shining Particles of Snow, with several Figures of them : By John Nettis, Doctor of Physic, and Oculist to the Republic of Middleburg, &c. Translated from the Latin.

Read May 13, 1756. **I** Had a mind to examine what kind of figured particles icy concretions consisted of. I found an icy star of six rays, with long striæ joined to them on every side, (which having, together with the rays, angles of sixty degrees, were wonderfully adorned on both sides with other long particles) in the midst of a large vessel of rain water :

water: but my endeavours were frustrated by the water, which adhering to the little star, as I took it up, was instantly frozen, and turned its figure, that was so exactly formed, to a crust.

And, as by comparing the icy stars, in the surface of the standing water, with those of snow, it seemed to me very likely, that the minute parts of ice had the same external configurations with those of snow, when the air was coldest, I prepared in the year 1740, to make the most minute observations, and the most exact drawings in my power of the most perfect figures of snow, which were not very irregular, the weather being then very favourable for the purpose.

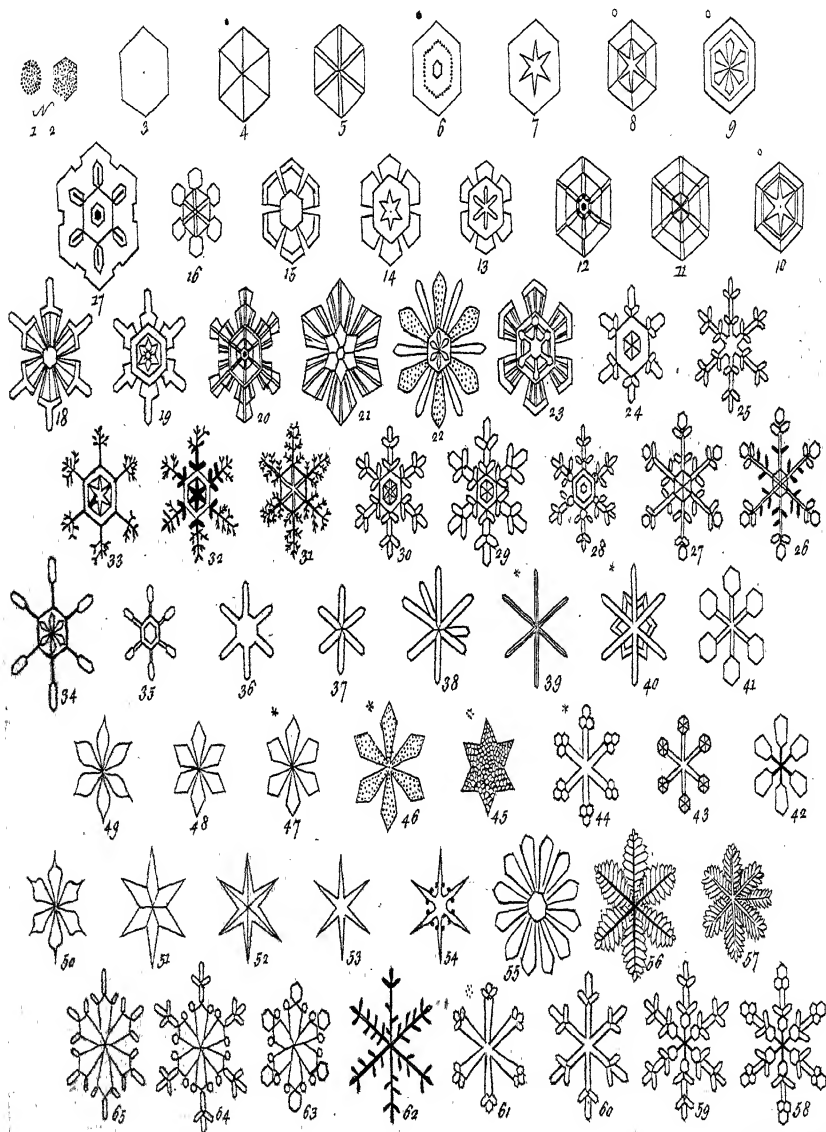
I first made use of double convex glass lenses of about an inch focus; then I used a compound microscope consisting of an object, and an eye glass, or two eye glasses, invented and carried to England by Corn. Drebelli s, an ingenious philosopher, as Huygens, in his Dioptrics, and others assert; and brought to greater perfection by the industrious English, by the addition of a concave speculum, placed under the object glass, in order to reflect a better light, and render the object more conspicuous.

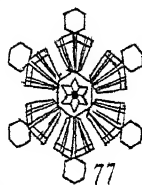
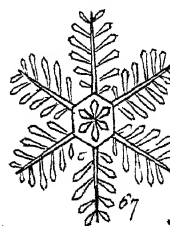
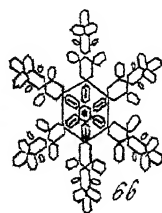
The weather being intensely cold, the snow, which fell, was hard, intire, and pellucid, and some particles being received upon a pencil, were placed upon a plane glass plate under the object glass: the greatest care was taken, that the smallest particles might not be dissolved, either by the breath, or perspiration of the hands, lest the little angles might, by the least degree of warmth, disappear. And thus, with this apparatus and these precautions, the extreme ex-

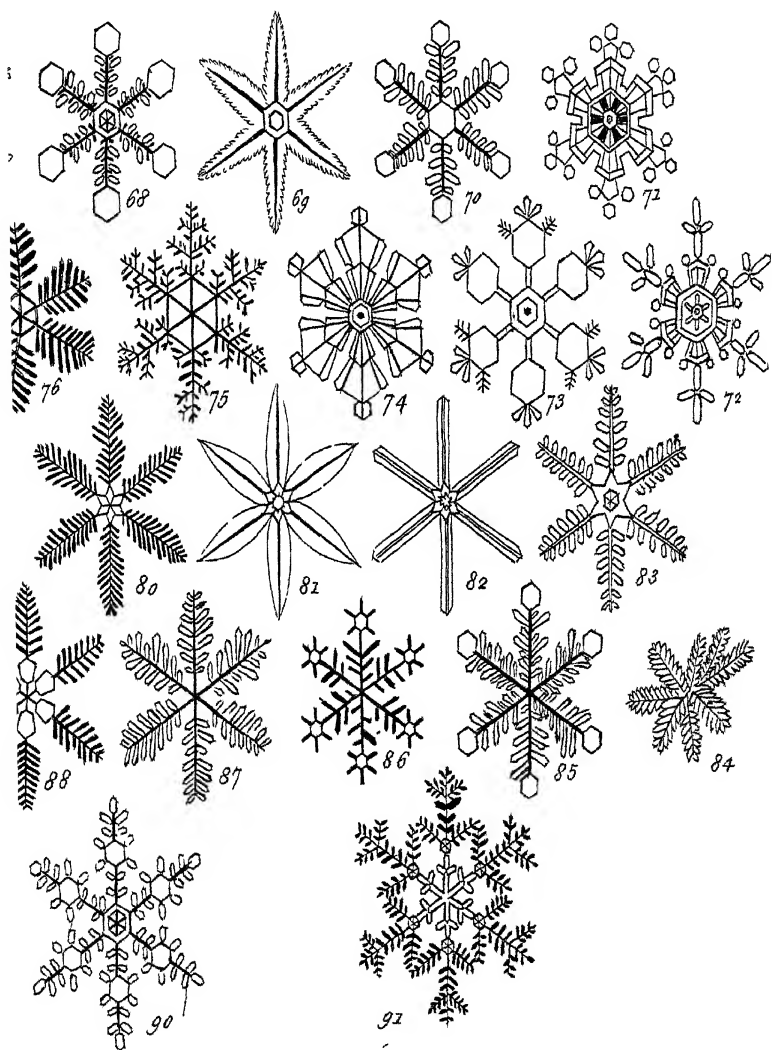
actness and equality of the figures of their most minute particles might be observed and delineated.

Some consisted of long round spiculæ; others approached to a round figure made up of small globules; but these were observed to be opaque, as the air was disposed to thaw; but when the air was frosty, many slender hexangular figures appeared, some of equal, others of unequal sides; such as are exhibited by Scheuchzer in his *Herbarium diluvianum*, and by Swedenburg in his *Prodromus principiorum*, p. 21; and such as I have seen in a pitcher, which was covered, in which the water was frozen; and such figures of the concretions of vitriol, salts, &c. as may be seen in the works of Leewenhoek, whom I find to be the most faithful and expert in delineating and describing the minutest natural bodies; and also such as are published by Capellar in his *Prodromus Crystallographiæ*.

Several little stars seemed to me to consist of six oblong, round, hexangular lamellæ, or indeed of six rays terminating in points; which little stars appeared to be formed of six plane rhomboidal particles. Several plane hexangular particles of equal sides, or oblong hexangulars, adhered to several of these stars, either at their extremities, or at each side of every ray. Some hexangular lamellæ of equal sides were adorned all round with six other lamellæ of the same figure and size, or with hexangular oblong lamellæ, and to these sometimes there adhered several others more or less. Many of these hexangulars were ornamented with six rays, and to these were fixed the most slender lamellæ, which were also hexangular, of equal or unequal sides; but of equal angles of sixty degrees;







degrees; and to these lamellæ others like them adhered, some greater and some less, but most of the latter; and others various like the fortifications of cities appeared to be joined to long hexangular spiculæ, and plane hexangles of equal sides.

In one day and night I found fifteen, twenty or more particles of snow differently formed; such as Olaus Magnus mentions; and in the year 1740, on the 11th, 12th, 13th, 21st, and 23d of January, and also on the 6th, 23d, and 24th of February, I had an opportunity of delineating eighty different admirable figures of snow, and of observing their numberless varieties.

And although a vast variety of these configurations of snow may fail or vanish in the same moment, yet the smaller particles, from their various combination with one another, constituting this wonderful variety of configurations of the snow, were observed by me to be comprehended under these following forms, viz. of parallelograms, or oblong, strait, or oblique quadrangles, rhombs, rhomboids, trapezia, or of hexangular forms of equal or unequal sides, whose angles are sixty degrees; and these hexangular particles were far more numerous than those of any other form mentioned.

The natural size of most of the shining quadrangular particles, and of the little stars of snow, as well the simple as the less compound ones, does not exceed the twentieth part of an inch: nor do the more compound particles the fifth of an inch. For the natural magnitude or rather smallness, see fig. 4. 6. 8. 9. 10. 35. 37. 39. 40. 44. to 47. and 61.

These beautiful various configurations to the number of 91, are in Tab. xx. and xxi.

N. B. Number 57 and 84, are anomalous figures of snow; of which there is an infinite variety, that may be observed.

XCIX. *An Account of the Copper-springs lately discovered in Pennsylvania: By John Rutty, M. D. of Dublin. Communicated by Mr. Peter Collinson, F. R. S.*

Read May 20, 1756. **I**N the province of Pennsylvania is a copper-mine, which affords a spring, that appears to have the same qualities as that Irish water, lately described by Dr. William Henry and Dr. Bond in the 47th and 48th volumes of the *Philosophical Transactions*, but is much sharper, for it will dissolve iron in a quarter part of the time; and we are assured, by the accounts transmitted from the proprietors of it of the trials they have made, that it yields the same copper-mud or dust as our Cronebaum-water, of the county of Wicklow, in this kingdom (being the water above mentioned) which being collected from bars of iron immersed in it, for the purpose of extracting the copper from the Pennsylvania water, it produced above half pure copper on being melted in a crucible; an experiment, that requires to be repeated, in order to ascertain the proportion of copper contained with accuracy; our copper-spring of the county of Wicklow yielding a proportion considerably larger than this, viz. 16 parts of copper out of 20 of the mud.

In the neighbourhood is a great abundance of the ores of vitriol and sulphur, and the spring comes
thence

thro' an immense body of vitriol-ore, and the supply of water is very large, 700 or 800 Hogsheads flowing in 24 hours.

The water is of a pale-green colour. of an acid, sweet, austere, inky and nauseous taste.

It is very ponderous, and instantly betrays the great strength of the metallic impregnation by the hydrometer; which, immersed in this water, presently mounted above the ball, and stood in it nearly at the same height as in a solution of one ounce and six drams of English vitriol in a quart of water.

A little of the solution of pot-ashes instantly precipitates the metallic parts of this water in grains of three different colours, viz. ochre-coloured at the top, green in the middle, and white at the bottom: and the appearances with spirit of hartshorn were much alike, except that the grumes at the bottom participated of a mixture of a blue colour with the white, indicating more clearly the mixture of Copper.

But iron immersed, above all other things, renders the contained copper conspicuous to the eye; for a clean knife, kept in it a few minutes, is covered with a bright copper-colour; and needles and nails kept immersed in it a month in a phial were covered with a rust, partly yellow and shining, which seems to be the copper, and partly a ferrugineous matter, as appeared by the magnet: and that it was partly cupreous appeared by the bright blue tincture extracted by spirit of hartshorn from such parts of the rust, as did not readily fly to the magnet; and, if one might rely on the Philadelphia experiment above-mentioned, the proportion of copper should be very large.

It is however certain, that, as in other copper-springs, so in this, here is a very considerable proportion of the vitriol of iron combined with it, and by all experiments a much greater than of the vitriol of copper; and accordingly, galls added to this water turned it first blue (the characteristic of martial vitriol) and then of a dilute ink-colour; and the corks in the bottles were blackened.

But the genuine quality, as well as large proportion, of the impregnating salt, will further appear by the following analysis of this water, viz. A pint of it, exhaled by a slow fire, left 400 grains of solid contents, which were partly green and partly ochre-coloured, with an intermixture of bluish, and of a rough, sweetish taste, like that of sal martis, and appeared to be chiefly saline, not leaving above four grains of indissoluble matter on dissolving 196 grains of it, and filtering.

Thus it appears, that the proportion of vitriolic parts in this water is very large, viz. above six drams to a pint or 3200 grains to a gallon; and consequently it is a stronger solution of vitriol than seawater is of marine salt; and, moreover, is truly considerably the strongest of all the vitriolic waters, that have yet occurred to my observation; for our Cronebaun water, in the county of Wicklow, gives but 256 grains from a gallon; Haigh in Lancashire, (the strongest in Britain, that I know of) 1920 grains; Shadwell 1320; Kilbrew, in the county of Meath, 1530 from the the same quantity; so that besides the copper to be obtained by immersing bars of iron, as in our county of Wicklow water, this water offers to its proprietors another peculiar advantage, viz. an oppor-

opportunity of erecting a copperas-work or manufacture of vitriol, like the Hungarian vitriol; especially the vast supply of water and plenty of fuel in the place considered.

The great strength of the vitriolic impregnation further appears from hence, that a little of this water, laid by in a closet in a porringer, did, by the mere effluvia, without any fire, form large crusts of green vitriol on the brims and outside of the vessel; which vitriol, although it appears both by the colour, taste, and the tincture arising from the mixture of a solution of it with galls, to be of the ferrugineous kind, yet plainly shews, that it partakes of a considerable proportion of copper by imparting the copper-colour, when moistened and rubbed on the blade of a knife, and moreover the indissoluble parts of the sediment of this water left in the filtre on dissolving it, exhibited a bright blue colour on being rubbed, and laid by with spirit of hartshorn; an appearance peculiar to copper.

This water, though justly suspected to be poisonous, if taken in its native strength, yet being lowered with common water it is frequently used for purging and vomiting the country people, and is useful in curing ulcers, and cutaneous disorders, and particularly for sore eyes.

Dublin, 22d, 4th month, April,
1756.

C. *Extract of a Letter from the Abbé Mazeas, F. R. S. concerning an ancient Method of Painting, revived by Count Caylus. Translated from the French by James Parsons, M. D. F. R. S.*

Paris, Nov. 17. 1755.

Read May 27, 1756. **I** AM to inform you of a discovery made here this year, which my long illness hindered me from communicating sooner.

The Count de Caylus, a member of the Academy of Inscriptions, had undertaken to explain an obscure passage in Pliny the Naturalist. This author (whom I have not now before me) says in some place of his works, that "the ancients painted with burnt wax;" and we have it from tradition, that pictures of this kind were very durable.

This was the passage, that the count undertook to clear up, in trying all the different ways that are possible, to paint in wax; and after many experiments, he hit upon a very simple method, of which he made a secret, in order to excite the curiosity, of the public. For that time, he only thought proper to shew one picture at the Louvre, representing the head of Minerva, painted in the manner of the ancients; and it was much admired. I saw it, and shall inform you by and by what effect it had upon me; but let us first return to speak of the public.

The several artists, who were desirous of knowing by what means the count came to make this discovery, made several attempts themselves; but in a great number of trials, only two are worth mentioning. The

The first was to melt wax and oil of turpentine together, and use it for mixing the colours. But this method does not at all explain Pliny's meaning, because wax is not burnt in this way of managing it: and besides, this method has two defects; the oil of turpentine dries too fast, and does not allow the painter sufficient time to blend and unite his colours.

The second method is very ingenious, and seems to come up to Pliny's notion very well: it is as follows: The wax is melted with strong lixivium of salt of tartar, and with this the colours are ground. When the picture is finished, it is gradually put to the fire, which increases the heat by degrees; the wax melts, swells, and is bloated up upon the picture: then the picture is removed gradually from the fire, and the colours do not at all appear to have been disordered: the colours then become unalterable by the action of the air, and even spirit of wine has been burnt upon them without doing them the least harm.

However, the following is the count de Caylus's method, which is much more simple; according to which the head of Minerva was painted, which was so much admired by all the Connoisseurs.

1st, The cloth or wood designed for the picture is waxed over, by only rubbing it simply with a piece of bees-wax.

2dly, The colours are mixed up with common water; but as these colours will not adhere to the wax, the whole picture is to be first rubbed over with the Spanish *chalk, and then the colours are used.

* Spanish white.

3dly, When the picture is dry, it is put near the fire, whereby the wax melts, and abforbs all the colours.

It muft be allowed, that nothing can be more fimple than this method; and it is thought, that this kind of painting is capable of withftanding the injuries of the weather, and lafts longer than paintings in oil; which I will not anfwer for.

The effect produced by thefe colours upon wax is very fingular; nor can one have any notion of it without feeling it. The colours have not that natural varnifh or fhining that they acquire with oil; but you are capable of feeling the picture in any light, or in whatfoever fituation you place it: in fhort there can be no falfe glare or light upon the picture for the fpectators: the colours are fecured, are firm, and will bear wafhing; and have a property, which I look upon as the moft important of any, which is, that they have fmoaked this picture in places fubject to foul vapours, and to fmoke in chimnies; and then by being expofed to the dew, it became as clean, as if it had been but juft painted.

This, Sir, is all that regards the new *encauftic* painting or painting in burnt wax: it comes from the word *encauftum*, which is all that remains about it: for the ancients have commonly left us the names of their difcoveries, without any account of them.

CI. *Observations on the Abbé Mazeas's Letter on the Count de Caylus's Method of imitating the antient Painting in burnt Wax : By James Parsons, M. D. F. R. S.*

Read July 1, 1756. **T**HE subject of the Abbé Mazeas's letter, concerning what he thinks the encaustic painting in burnt wax, is very difficult to understand ; for although the count de Caylus has made an essay to find out the method of the antients in that kind of painting, his success, in the head of Minerva, mentioned in the Abbé's letter, does not seem to explain Pliny's meaning. This author is so very short and obscure in most things, that a bare literal translation of some parts of his work would hardly be reconcileable to sense ; and this is no where more evident than in this very subject.

I confess I do not pretend to understand what he means by painting in burnt wax, though I have considered it over and over, since my having translated the above letter. However, it may not be unenterprising to the Society, to hear a few passages of Pliny taken notice of upon the matter, by which, perhaps, some of the worthy members of this learned body may enter farther into it.

The two principal methods tried at Paris were these ; the Count's was waxing over the cloth or board, mixing up the colours with water, and rubbing the waxed ground over with Spanish chalk, in order to make the colours adhere to the waxed ground. The other was by mixing other ingredients with the wax

and colours and laying it on. In both these methods the picture is moved to the fire gradually, in order to liquify the wax, and blend and unite the colours, and then moved from it by as slow degrees. This cannot be called burning in wax, nor be counted encaustic painting; unless *uro*, or the Greek *καίω*, could signify to liquify as well as to burn, in which sense I never met them any where. And if these words mean only to burn, then encaustic painting can signify no more nor less than painting in enamel; in which wax, from its very nature, can have no share. And yet at the end of the 11th chapter of his 35th book, he seems to give *uro* another meaning: he is admiring the wonderful effects produced in dying stuffs, which being first scowered, are laid over with some colourless material, in whatever pattern they choose; and upon being dipped in a caldron of boiling liquor, the stuffs appeared to be finely and variously painted; "*Cortina pingit dum coquit; et adustæ vestes firmiores sunt, quam si non urerentur.*" Here *uro* must signify to boil; for we cannot say the burnt stuffs were become stronger, than if they had not been burnt.

In the same book he has these words:

"Encausto pingendi duo fuisse antiquitus genera
 "constat, cera et in ebore, cestro id est viriculo;
 "donec classes pingi cœpere. Hoc tertium accessit,
 "resolutis igni ceris penicillo utendi: quæ pictura
 "navibus nec sole, nec sale ventisque corrumpi-
 "tur."—

The close translation of this seems to be as follows:

"It appears, that anciently there were two kinds
 "of encaustic painting, in wax, and in ivory, with a
 "stilus;

“ stilus ; until ships began to be painted : then this
 “ third kind came up of using a brush or pencil, with
 “ wax melted by fire, &c.” Now tho’ Pliny uses the
 word *pingendi* in the two first, we cannot understand
 that he could mean the laying on of paint, since the
 instrument (the cestrum) being pointed, is incapable of
 such an office ; and secondly, because he immediately
 mentions a third kind of painting distinct from, and
 an absolute contrast to the other two, wherein the
 paint with the melted wax was laid on with a brush ;
 and this contrast is very strong in another passage in
 the same chapter, where he speaks of a famous vir-
 gin called Lala, of whom he says, “ Romæ et peni-
 “ cillo pinxit, et cestro in ebore, imagines mulierum
 “ maxime.” That is she painted at Rome with a
 pencil, and with the cestrum or stilus upon ivory,
 chiefly the images or portraits of women.

We cannot help thinking, that what was done with
 the cestrum, either upon the wax or ivory, was mo-
 dellling or carving ; for the modellers of this day, in
 their compositions of wax and other materials, use
 pointed tools to repair and render their figures sharp ;
 and the workers in ivory use such tools of various
 points and edges for the same purpose.

It will not be amiss in this place to take notice of
 the sense, in which Mons. Durand puts this passage, of
 which he makes a very loose translation in his history
 of antient painting : viz. “ Il faut que j’indique ici
 “ en peu des mots ce que c’est que cette peinture
 “ en cire, que l’on perfectionne avec le fer : pour
 “ cela il faut sçavoir, qu’ anciennement il y en avoit
 “ de deux sortes ; dans la premiere, on employoit la
 “ cire preparée en divers couleurs, qu’on appliquoit
 “ en

“ ensuite sur le bois, suivant l’esquissé qu’on y avoit
 “ tracée, ou creusée avec un fer chaud ; dans la se-
 “ conde on gravoit de meme dans l’yvoire, avec un fer
 “ aigu et ardent les contours et generalement l’idée de
 “ tout de sujet, apres quoi on appliquoit les couleurs
 “ pour les Ombres, en laissant l’yvoire pour les jours,
 “ et perfectionnant le tout ensemble par le moyen
 “ du feu, comme on le pratiquoit aussi pour le
 “ bois.”

Now it is very easy to see, that Pliny’s words are
 very different from any thing in this translation ; and
 that this may be more plain, I here give a close
 translation of Mr. Durand’s words : viz. “ I must
 “ shew here what this painting in wax is, which was
 “ finished by fire. It must therefore be remarked,
 “ that in antient times there were of two kinds of
 “ this painting ; in the first they used wax pre-
 “ pared in divers colours, which they then put
 “ upon the wood, according to the design they had
 “ traced out with a hot iron. In the second, they
 “ engraved in the same manner upon the ivory, with
 “ a sharp burning iron, the contour, and generally
 “ the idea of the whole subject, after which they ap-
 “ plied the colours for the shades, leaving the ivory
 “ for the lights, and finishing the whole by the
 “ means of fire, as they also practised it upon
 “ wood.”

Monsr. Durand has gathered these notions from *Pere
 Hard.* and *Boulenger de pictura veterum*; which are no
 more applicable to Pliny, than they are practicable in
 themselves ; Pliny has no such meaning, for his
 words are very clear, as I have shewn it before : but
 he takes the same liberty in that passage of the fe-
 male

male painter, Lala, just mentioned, upon whom the words of Pliny are very precise; “Romæ et penicillo pinxit, et cestro in ebore:” which Mons. Durand has rendered thus: “elle peignot a Rome, ou sur le bois, ou sur l’ivoire, comme on vouloit, ou avec le pinceau, ou avec de cire colorée.” “She painted at Rome either upon wood or upon ivory, as she thought proper, either with a pencil, or with coloured wax.” Now Pliny has not one word of wood or coloured wax in this passage; nor could he mean any other, than that she sometimes painted with a pencil, and sometimes carved in ivory.

I am therefore inclined to think, that when Pliny mentions *cera* in the singular number, altho’ he says *pingere*, yet as the *cestrum* is mentioned with it, it must be understood to mean carving or modelling; but that when it is in the plural, as in the following cited passage, and of burning the picture, he must mean the true encaustic or enamel painting, and the *ceris* must mean a composition, which was capable of enduring the fire; for which, perhaps, the following short reasons may have some weight.

It appears in the 2d chapter of his 35th book, where Pliny is speaking of the *Honos imaginum*, that modelling was greatly practised, especially the busts of great men, and of very ancient standing. These were made during the lives of the persons, and laid up in their armories, or other repositories, till their deaths, in order to be carried before the deceased in their funeral rites, and exposed to the public, while an oration was made by the nearest of kin, who pointed to the image, as he proceeded, in his Elogium upon the virtues of the person represented: and
th s

this image was modelled in wax, as our wax-work is made to this day, and painted in natural colours, in order to come the nearer to nature. Pliny's words are very clear in this; "expressi cera voltus singulis
 "disponebantur armariis, ut essent imagines, quæ co-
 "mitterentur gentilitia funera, &c." And it is also evident, that in order to take the true resemblance of the persons, whose busts they intended to make for these purposes, they took off a plaister mask from the face, and by way of mould, cast melted wax into it; whereby they obtained every feature, and afterwards made it perfect by repairing with proper tools. This is fully declared in his 12th chapter of the same book, which treats of plastics: wherein after he has mentioned Dibutades a potter of Sicyon to be the first inventor of forming the likeness of things in clay or plaister, and of first making images upon the corners of his tiles, he gives the invention of taking off masks from the face, for making busts, to Lisistratus, of the same town, brother of Lyfippus, in these words:—

"Hominis, autem imaginem gypso e facie ipsa
 "primus omnium, expressit, ceraque in eam for-
 "mana gypsi infusa, emendare instituit Lisistratus
 "Sicyonius, frater Lyfippi; hic et similitudinem
 "reddere instituit.—crevitque res in tantum, ut nulla
 "signa statuaræ sine argilla fierent; quo adparet
 "antiquiorem hanc fuisse scientiam, quam fundendi
 "æris." In a word, they appear, in the sequel of this chapter, to have imitated fruits, fishes, and every-thing else, by making clay moulds, and casting the wax or other matter, into them. It is, by the way, remarkable, that in all these cases of casting or modelling *cera* is in the singular number, and must be taken

taken in its literal sense, as being a matter very capable of such a manufacture.

Now on the other hand, when that word is in the plural, there is some reason to conjecture, that a certain composition is meant, capable, as I have said before, of bearing the fire, or when it is laid upon ships with a brush; for we can neither suppose, that wax was ever capable simply to bear being burnt, as the *encausticæ picturæ* expresses and denotes it; nor that the *ceris igni resolutis* was to be simply laid on their ships without paint, rosin, turpentine, or some other matters, both to render it ductile and fluid enough not to clog the brush as it cooled, which every one must allow wax would infallibly do; and also to give it such a body, as that, when dry, it might stand the injuries of the weather; for the heat of the sun would melt simple wax, and make it run down in streams, without an admixture of something else to give it the necessary firmness.

The following I believe to be the words, which the Count de Caylus and the French painters have endeavoured to follow. Plin. lib. xxxv. chap. xi.

“ Ceris pingere ac picturam inurere quis primus
 “ excogitaverit, non constat: quidam Aristi dis-
 “ ventum putant, postea consummatum a Praxitele;
 “ sed aliquanto vetustiores encaustæ picturæ exti-
 “ tere, &c.”

Here again is the *ceris* in the plural, where he talks of burning in the picture, and where in the same sentence he calls it *encaustæ picturæ*. I would, therefore, humbly ask, whether wax painting, strictly speaking, would ever bear burning in; or whether,

according to the count's manner, a gentle colliquation by a gradual flow approach of the picture to the fire, and as slow a removal of it back again, can be called *excaustic painting*?

I might add much more to my purpose, by entering into the nature of varnishes, pottery, glass-making, and furnaces of the antients; which would throw more light upon the subject, and shew, that they were well acquainted with what colours would bear the fire, as well as with such as would not; for Pliny's chapter upon the different pigments must have been collected from antient authors as well as from his contemporaries, and contain a catalogue of those used by the painters, which consists of a very great number of articles.

That the antients were well acquainted with enamel painting cannot be doubted, since there are great numbers of their enamel pieces in the cabinets of the curious in many places. There is one, which is a Roman cup curiously enamelled upon brass, found at Froxfield, in the possession of Lord Hertford: there is a Roman enamelled platter upon the same metal, probably belong to the cup, with figures and inscriptions curiously painted in the enamel, of Leg. ii. Aug. and Leg. xx.v.v. in Britain, a drawing of which Dr. Stukely made in its colours. (See Buonroti's *Offervazzioni* on the Duke of Tuscany's Medallions.) And the Doctor has now an enamelled fibula of the same kind of workmanship; nor are there wanting cups with portraits of some friends enamelled at the bottoms, which were used *inter pocula*, to drink to their memories; and I cannot but think it probable,

probable, that the enamelled ware of cups, platters, ewers, and such like, which the great Raphael was concerned in making, many of which are now in England, were made in imitation of the antients; since in every other part of his art, he was so close a follower of their most correct works, and since the colours and appearance are exactly the same in his, that are upon those antient pieces mentioned. All I have further to say is, that if there be any thing amiss in these conjectures, I freely submit to the judgment and correction of any better judge.

CII. An Account of the late Earthquakes felt at Maastricht, in a Letter from Monsr. Vernede, Pastor of the Wallon Church there, to Monsr. Allemand, Professor of Philosophy at Leyden, F. R. S. Communicated by Mr. Abraham Trembley, F. R. S. Translated from the French.

Maastricht, May 1, 1756.

Read May 27, 1756. **T**HE following are the observations, which I have been able to communicate to you, relating to the earthquakes, which we have felt here.

The number of the shocks has been very considerable. From the 18th of February to the beginning of April no day passed, in which one was not

were some others no less violent, in my opinion, but of much less duration.

In general they were felt more sensibly in the upper rooms than on the ground-floor; and less by those, who were then walking either in the city or country, and not at all by many. The motion was likewise different, most commonly, according to the quarters of the city, and was not the greatest in the highest parts of it.

All the shocks were not of the same kind. The motion was undulatory in those of the 26th of December, and 18th of February; but the undulations on the former of these days were longer than those on the latter.

At other times there were observed only a rising and sinking again; and most commonly a shaking on one side. I had suspended a weight over my billiard-table some lines above the carpet; and I had surrounded it with billiard balls. I designed to remark by this contrivance the direction, and, to a certain point, the degree of the force: but my balls did not move; nor did I make the experiment till after the great shocks were passed. With the same view Mons. Hofman had exactly filled with water a large vessel, which he had powdered all round: but he undertook this method as late as I did mine. Once only some drops of water fell from the vessel. A good number of people pretended to have observed the direction; but, in my opinion, there was none sensible to us.

During the most violent shakings there were some kind of flashes of lightning. The whole was preceded by a groaning under-ground, which, when the
shocks

shocks were weakest, I could compare to nothing so well as the noise of a cart deeply loaded, heard at a distance; and when they were strongest, to that of a coach rolling swiftly under the place. I have also heard more than once these groanings, when they were not followed by any sensible shocks.

These shocks have happened in all kinds of weather, dry, rainy, cold, &c. only I have always remarked, that it was calm at the time, and the wind rose afterwards. No hours have been exempt from them. If they have been more felt in the night, this was perhaps, because people were then more quiet, and in their upper rooms; and because fear rendered them attentive to every thing.

During the whole time, that we had these earthquakes, the magnetic needle and the barometer very much varied. The latter indicated very dry weather, while it was continual rain.

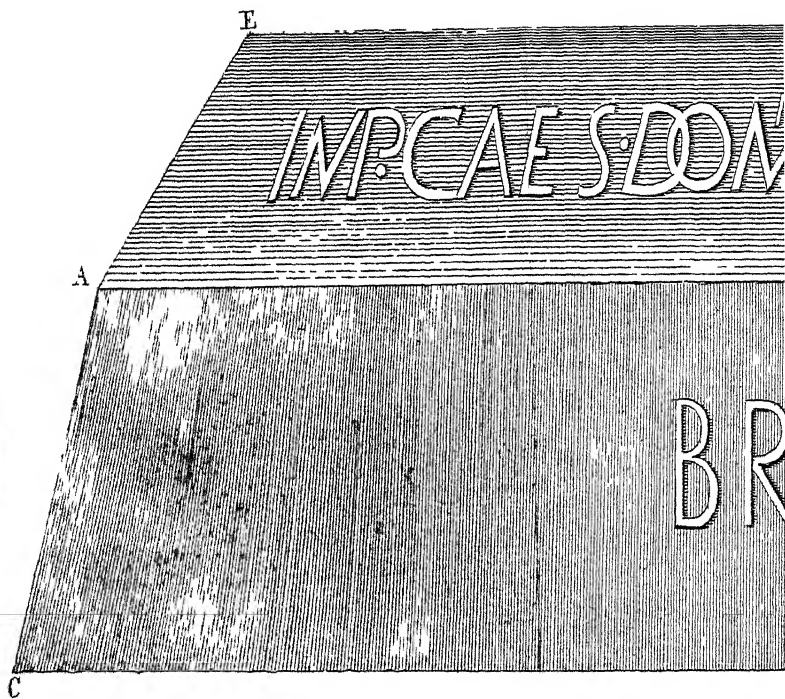
The west-wind blew constantly all the preceding summer.

A little before the shocks began to be first felt, we had *Auroræ boreales*.

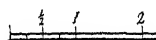
When the sky was clouded, there were often observed between the clouds red streaks like fire. Fogs were very frequent. The weather was extremely uncertain. Sometimes it seemed to set in for fair; but soon after there arose clouds extremely low from the west.

I proceed now to the consequences of these earthquakes. They were not at all fatal here. The consternation was very great. Several persons felt very singular motions, which they compared to the great electrical shock. Afterwards, they imagined every moment,

*A Draught of two peices of
found on Hayshaw mo*



		Inch
Length	at the top from A to B	21
	at the bottom from C to D	23 $\frac{1}{2}$
Breadth	at the top from A to E	3 $\frac{1}{2}$
	at the bottom from D to F	4 $\frac{1}{4}$
	perpendicular thickness	4



*The top is some
Height of the*

*lead, similar to each other,
or in YORKSHIRE.*



Scale of Inches
3 4 5 6 7 8 9 10

*venhat hollow, and the letters are in relief.
lead, 1 hundred, 1 quarter, and 16 pounds.*

moment, that there were new ones. The rattling of glass-windows was the least ambiguous sign. China fell down from the chimney-shelves. The dishes in kitchens struck against each other. Some chimneys were thrown down. Several walls cracked, and some arched roofs were damaged.

In our neighbourhood there happened no worse accidents than these. At Aix la Chapelle, a woman was crushed to death by the falling of a chimney. Two houses, which joined, were separated. The waters, it is said, acquired more strength, as happened at the end of the last century. This is what I will not answer for the truth of, not having received sufficient information in that respect.

At two leagues distance from Stolberg there was formed an opening of about twenty feet long, and several feet deep, from which, it is affirmed, there arose the two first days stinking vapours: but it filled up of itself, and is now almost intirely closed. This is the fact, which has been so much exaggerated in the Gazettes.

My father-in-law was curious to know, what was the effect in the mines of Houille, in the country of Liege; and this is the account, which he received as what might be depended upon.

In a mine of 900 feet depth, the workmen were sitting at breakfast on the 18th of February. Of a sudden they were pushed violently one against another, so that they thought, that some of them were at play: but seeing, that those, who sat alone, were shaken in the same manner, they ran to ring the alarm-bell. The overseer called out to them from
above

above, that it was an earthquake, from which they had no reason to be under any apprehensions.

On the same day (18th of February) there was an extraordinary motion in our waters, particularly in the Meuse, which was agitated as if it were by a whirlwind; and the Jaur, a small river, which runs through our city, and was full before the earthquake, sunk very low immediately after. In some places the waters of wells were troubled; but they were not so with us.

The animals were affected by the shocks. I was informed, that the horses and cows made a great noise, even a considerable time before; and at my house the hens and pigeons did the same.

CIII. *An Account of the Agitation of the Sea at Antigua, Nov. 1, 1755. By Capt. Affleck of the Advice Man of War. Communicated by Charles Gray, Esq; F. R. S. in a Letter to William Watson, F. R. S.*

S I R,

Read June 3, 1756. **I**N a letter I had from Capt. Affleck, commander of the Advice man of war, dated from Antigua the 3d of January last, are the following paragraphs.

“ The year was usher’d in here by the shocks of
 “ an earthquake, which is the second I have felt at
 “ this island; neither of which have been violent
 “ enough to do any damage. On the 1st of No-
 “ vember

“ vember last, I find you had a remarkably sudden
 “ flux and reflux of the sea at Portsmouth, and
 “ other parts of the coast, which was agitated in
 “ like manner, at the same time, on the coast of
 “ America, and all these islands. The tide rose
 “ here twelve feet perpendicular several times,
 “ and returned almost immediately: the same at
 “ Barbadoes: At Martinique, and most of the
 “ French islands, it overflowed the low land, and
 “ returned quickly to its former boundaries. The
 “ people at Barbadoes were never more astonished;
 “ the rising water in Carlisle Bay appearing as black
 “ as ink, instead of the clear sea-green.

“ Since I wrote this, I have taken a more par-
 “ ticular account of the flux and reflux above-men-
 “ tioned, from an observing man of this island;
 “ who remarked, that here it began at half an hour
 “ after three in afternoon, on the 1st of November
 “ last; and flowed, every five minutes, five feet per-
 “ pendicular, till as much after six, without any
 “ violent disturbance on the surface of the water.

P. S. In Martinique, in that remarkable flux and
 “ reflux of the sea, it was in some places dry
 “ for a mile; and, in others, flowed into the
 “ upper rooms of the houses, and destroyed
 “ much coffee: At the island of Sabia, it flowed
 “ twenty-one feet; and at St. Martin's, a sloop,
 “ that rode at anchor in fifteen feet water, was
 “ laid dry on her broadside.”

If the Royal Society have not yet had any more
 particular accounts of this matter from the West-
 Indies, the above is at their service; and, with my

most respectful compliments to Lord Macclesfield
and the rest of the lords and gentlemen,

I remain, Sir,

Colchester, May
26, 1756.

Your very obedient

humble servant,

Charles Gray.

CIV. *An Account of a remarkable Fossil, in
a Letter from Edward Wright, M. D. to
Mr. Peter Collinson, F. R. S.*

Read June 3, 1756. **I** HAVE profited of the occasion of Sir Thomas Webb's going to England, to send you the draught of a pretty curious fossil, which you will probably receive about the time that this comes to hand. This fossil I discovered in a marble table, in an inn at Ghent, in a tour I made about a month ago to Bruges, and some other parts of these countries, in company with our ingenious and worthy friend Mr. Needham. This table, the Landlord told us, he purchased at the sale of an ancient family in the neighbourhood, and said he believed the marble was of this country, though he could not be certain.

The fossil is what is called by naturalists *Orthoceratites*, and is one of those, which I think is never found in its recent state. They are, I believe, very rare in England. This is by much the largest I have

have ever had occasion to see, and exceeds by many inches the longest I have read of. So as we can plainly trace it ; it measures two feet four inches and 7-10ths in length, as marked at letters A, B, C, *d*. (Tab. xxii.) Fig. 1. It has originally been several inches longer, as you may easily trace out by continuing the straight lines, which terminate its edges, until they meet in a point. These shells are of the concamerated kind, and in this sixty-six partitions may be distinctly counted, and it must certainly have had a considerable number more, which are hid by the end part being immersed too deep in the marble. As the end of it does not appear, I have at Fig. 2. represented the narrow extremity of a much shorter, but very distinct one, in the same table, where several of the kind are to be seen, but none near so long as Fig. 1. the longest, as I remember, not measuring above eight inches. In Fig. 2. at F, the siphunculus of one of the concamerations pretty plainly appears, and probably all the partitions have originally had the same as in the Nautilus.

In the design I here send you, which I took upon the spot, with a crayon, and have since worked out as accurately as I could with Indian ink, I have preserved the just dimensions of all that can be traced of this large shell. The marble, in which it is immersed, is of a coarse grain, and of a dusky brown colour, interspersed with a dirty white : of this colour the shell itself is tinged, and all its concamerations filled with the stalactical matter of the marble.

The concamerations or partitions of these fossils resemble those of the nautili, though it would be very improper to give them that name, for this shell is

never seen in the seas, nor caught at such depths, as we have had occasion to fathom or search: hence can never be classed among the sailors; nor indeed does it seem at all proper for exercising that function, from its long narrow pointed shape, so very different from that boat-like figure requisite for sailing. Its concamerations seem principally intended for performing the motions necessary to the animal, at the bottom of the sea, and at greater depths, from whence it does not seem ever to rise to any considerable height.

Brussels, May 18,
1756.

Edw. Wright.

CV. *An Account of the Orthoceratites:
In a Letter from Edward Wright, M.D.
to Mr. Peter Collinson, F. R. S.*

S I R,

Read June 17,
1756. **I** HAD the honour of sending you some time ago a drawing and short account of a very large Orthoceratites, which I hope you have received. As you are so good to accept favourably my poor observations, and to honour me with your correspondence, I here take the liberty to send you a few remarks, which the consideration of this and other fossils, and of the strata of the surface of the earth, naturally lead me to. If I am obliged to differ from Mons. de Buffon, and other modern theorists, it is only for the sake of truth, and its unalterable laws; it being quite contrary to my inclination

dion to criticize the works of others, especially those of so learned a gentleman, as the above-mentioned academician, for whose merit and talents I have a particular respect, except where the clearest conviction, in opposition to his opinions, forces me to so disagreeable a task.

I. The *Orthoceratites* is one of those shells, which are never found in the recent state, and is to be classed among *Conchæ pelagiæ* of the naturalists, which never approach the shore, but continue always at great depths of the sea, contrary to the *littorales*, which frequent the shores and shallow places; and hence, when found fossil, are easily to be matched with recent specimens.

Pelagian or ocean shells are frequently found fossil very near the surface, as every naturalist knows, which proves, that such places have formerly been the sea-shore. Hence it is clear, that the cause, which transported them thither, acted suddenly; which agrees perfectly with the account of the deluge given by Moses in the holy scripture; and, at the same time, overturns the system of Mons. de Buffon, and the author of *Telliamed*, who pretend, that the earth was for many ages covered with water, and that in that long course of time it was, that the shells, which we now find fossil, were gradually produced; hence that they are to be considered as the remains of innumerable successive generations of marine bodies, formerly the only inhabitants of the globe. The greatest depths of the sea, as yet sounded, have been found to be about 3000 fathoms, and the ordinary depths are about 150; which makes it evident, that were the theories of these gentlemen true, such fossil shells

shells ought never to be found at less depths in the earth than from 150 to 3000 fathoms.

II. Though fossil shells are to be found in almost all the plainer parts of the surface of the earth, yet there are certain very large tracts, where such bodies are never found, *viz.* the mountains, which seem to be the remains of the original strata of the earth. It is true indeed, that there are many eminences, which have been by our modern theorists taken for mountains, where sea-shells, and calcareous matter, of every kind, are to be found in great abundance: but these are very inconsiderable, and only appear as little hillocks, compared with the large mountains, which contain mines, veins of metal, and precious stones, and may be traced in immense chains, without almost any discontinuity from one continent to another; and from continents to neighbouring and opposite islands, &c. insomuch that all these chains not only of the old, but likewise of the new world seem connected one with another; an observation which alone would indicate the importance of diligently inquiring into their structure, in order to form a true theory of the earth. Mons. de Buffon and the author of *Telliamed*, who endeavour to prove, that all mountains have been formed by sea-carrents, and bring one of their principal arguments in proof of this opinion from marine bodies being found in great quantities in the strata, of which they are composed, seem never to have made observations on mountains; else they might have observed this remarkable difference between them and the calcareous strata of the plains, that the former contain none of those marine bodies, though the latter are almost intirely made up of them.

In

In the Alps, Appennines, and Pyreneans, no shells nor marine bodies of any kind are to be found: in the *Ochels*, a branch of the large Grampian Mountains in Scotland, which I have had occasion diligently to examine, I could discover no marine bodies. The same is observed of all the large mountains of Africa, and of Asia; and in the huge chain of Cordilleres in Perou Mons. de la Condamine searched in vain for such bodies. This kind of mountains, (which indeed alone deserve that name) are chiefly composed of vitrifiable matter; and if they are sometimes found to contain sea-shells, it is never to great depths, nor in their original metallic or stony strata; though such bodies are found in great abundance at the foot of mountains, and in the adjacent valleys, in which there are many eminences in some parts continued in small chains, though but of small extent, which contain marble, sea-shells, chalk, and other calcinable matter, but never any veins of metal, though we frequently find in them pyrites, ocre, vitriols, and other minerals, which have been washed down from veins of iron and other metals, with which the higher mountains abound, and have afterwards been deposited in the calcareous strata of the valleys.

III. Mons. de Buffon pretends, that all mountains have been formed by sea-currents; and a little afterwards tells us, that all sea-currents are occasioned by sea-mountains. Is it not natural here to ask, Which of these two causes pre-existed? Can such reasoning as this, a *circulus viciosus* of the grossest kind, ever tend to improve our knowledge, or give us just views of the works of the great Creator?

The

The learned academician founds his opinion of all mountains having been formed by sea-currents, principally upon two observations. The first is, that they are made up of strata composed of sea-shells, and petrified marine bodies of different kinds: the second, that in chains of mountains the prominent angles always correspond with the depressed ones on the opposite side of the valley, in the same serpentine way as we observe in rivers, the banks of which are alternately hollowed and prominent, according to the different resistance they give to the current of the water. This observation was first made by Monf. Bourguet, and must be owned to be curious and interesting. Monf. de Buffon is of opinion, that these two essential observations put together form an invincible argument in proof of his theory, and such as could scarce have been expected in so seemingly obscure a point. As to the first observation, that all mountains are made up of strata composed of marine bodies, it is so far from being true, that *no mountains, properly so called*, contain such bodies: and as to the second, of the correspondence of the opposite angles of mountainous tracts, it does not at all prove, as he would have it, that sea-currents have formed these mountains, but only that there have been formerly such currents running between them, which currents have given them that form we now observe them to have. To assert, that because currents of water have given them that figure, therefore they have produced them, is as ridiculous, as if one should say, that a river had reared its own banks, merely because it had given them a serpentine form.

IV. Monf. de Buffon, who pretends, that the earth was at first entirely covered with water, which afterwards dug channels for itself, and thus separated the sea from the land ; and the author of *Telliamed*, who endeavours to prove, that this water goes insensibly off by evaporation ; and who, as well as Monf. de Buffon, attributes the number of sea-shells, found fossil, to the length of time he supposes the now inhabited parts of the earth to have been covered with water, seem not to have given sufficient attention to an observation of consequence, which is, that the greatest part of our fossil shells are entirely foreign to Europe, and belong to the Equator or Tropicks. Monf. de Buffon himself seems to have been somewhat aware, how much this observation might make against his theory ; for he observes in answer to it, that not to mention such shell-fish, as inhabit the bottom of the sea, and from hence, being difficult to be caught, are regarded as unknown and foreign, though they may be produced in our seas ; by comparing our fossil shells with their analogous living shell-fish, we shall find amongst them more shells belonging to our own coasts than of foreign ones ; for example, that pectens, pectuncles, mussels, oysters, sea-glands, buccina, sea-ears, patellæ, &c. which we find fossil almost every-where, are certainly productions of our own seas. But unluckily for our ingenious theorist, these shells, he mentions as common on our coasts, are produced in all the seas of the globe, and are equally inhabitants of the equator and poles ; though we frequently discover fossil species of them, which are peculiar to the warmer climates.

Since then it is certain, that all our fossil shells are foreign to our climates, except such, as are common to the whole globe, we may conclude, that *Monf. de Buffon's* theory is in this respect absolutely defective. Besides, we find not only a very great quantity of fossil shells and other marine bodies, but likewise a great number of impressions of foreign plants, mostly of the capillary kind, on slates and other stones; and it is now certain, that all the fossil wood of *Lough-neagh* in Ireland (as in most other places, where such wood is found) has been produced in a different climate; and, if I mistake not, has been compared and found to agree with recent specimens from America. Bones, and even intire skeletons of rhinoceroses, elephants, and other foreign land animals, are discovered pretty commonly through all Europe; and in Ireland, very large horns of American moose-deer have been dug up. All these substances are commonly found near to, or in the same strata with, fossil shells, and other marine bodies; and all of them, whether original productions of sea or land, appear evidently to have been deposited in the places, where we now find them, by one and the same cause. To account for these phenomena, I believe *Monf. de Buffon* must admit a universal deluge, such as is related in the Holy Scripture: and if a deluge of this kind is once admitted, why should we assign other causes for the transportation of marine and terrestrial bodies into climates foreign to those, where they were produced? Why, say *Monf. de Buffon* and the author of *Telliamed*, because many thousands of years seem to have been requisite for the production of so immense a quantity of sea-shells as those we find

find every-where fossil; and besides, says the author of Telliamed, their disposition is so regular, that it is plain the confusion of a deluge could never have placed them in such a manner. But as to the immense quantity of fossil shells, upon which these gentlemen insist so much, they have been misled by imagining, that many parts of the surface of the earth contain marine bodies, which evidently do not; and these parts are, as I observed above, the mountains properly so called, in the constituent strata of which no sea-shells nor marine bodies of any kind, no bones of land animals nor impressions of plants, are to be found. And as to the regular disposition of these bodies, this could not have happened in supposing a violent commotion of the waters to have continued the whole time they covered the earth. But is such a supposition natural or necessary? From the scripture account, I am sure, it is not; for the *rupti sunt fontes abyssi* implies, that this was only to procure water sufficient for the deluge; and that the waters afterwards receded gradually, and were restored to tranquillity before they entirely disappeared, is manifest from the same inspired writings. Upon the whole, we may dare boldly to advance, that we meet with daily observations, that destroy all the fine hypotheses of our modern theorists, but not a single one in the least contradictory to the simple, and at the same time sublime and true account delivered by the sacred historian. How vain are the efforts of man, when he has the boldness to set up the chimæras of his own brain in opposition to so much of the truth, as Almighty God has permitted us to discover from his holy word, and from the observation of his works,

which he has given us talents to contemplate and admire!

V. The deluge must have produced very considerable changes on the surface of the earth. Many Volcanos seem to have been formed at that time by the accumulation of animal vegetable and mineral substances into huge masses, which have afterwards fermented and putrified, and in process of time burst out into flames. Earthquakes must have been frequent the first years after the deluge by the fermentation of these heterogeneous bodies, before the remains of so prodigious an inundation could be dissipated; for wherever there is any intestine commotion in the earths, it's violence must be greatly increased, if it meets with water, and by its heat reduces it into vapour, which we know acts with an immense force *. That this must have been the case the first years after the deluge, may be inferred from the abundance of moisture it must have left, and the fermentation of so great a quantity of heterogeneous substances buried in ruins by that memorable catastrophe. There are many observations, which seem to prove, that the earth, or at least many parts of its surface, have suffered by fire; not to mention the marks of it, which are to be observed on many mineral substances. The artificial production of potter's earth or clay is a very strong argument in support of this opinion. Potter's earth, as is well known, is

* This seems to be the reason, why places situated upon the seashore, or upon large rivers, as was the unhappy city of Lisbon, suffer more from earthquakes than more inland situations, where such circumstances do not concur.

found plentifully in most low grounds and vallies between mountainous tracts, and where calcareous strata abound. By exposing common flint-stones to the confined vapour of boiling water in Papin's digester, a clay of the very same kind may be formed, and is no more than a decomposition of the flints. Hence it would appear, that wherever this clay is to found, there the earth has undergone some violence from fire; and that this has been effected by earthquakes soon after the deluge seems extremely probable.

The deluge has given origin to many fossil substances, and produced many combinations, which otherwise would not have happened. Chalk is no more than the ruins of sea-shells, and limestone consists of the same bodies cemented together by a stony juice. Amber appears evidently to be the resin of antediluvian trees (which are frequently found along with it at this day) united to the acid of sea-salt, which abounds in the earth. The reason of insects, straws, &c. being immersed in amber, absolutely inexplicable from the hypothesis of its being of mineral origin, is now no more a secret; for we know, that nothing is more common than to find such bodies immersed in the resin of trees. Fossil sea-salt or salt-gem seems to have been deposited in the quarries, from whence it is dug, at the time of the deluge. All or most part of pit-coal appears to be of diluvian origin, for it gives a *caput mortuum*, the texture of which exactly resembles that of burnt wood. We may reasonably suppose large forests to have been buried at the time of the deluge, which have undergone a fermentation and putrefaction in the earth, so that the colour of the woody part has been

been changed, though the texture has remained entire enough to allow us to distinguish to what kingdom it belongs.—All bitumens, pissasphaltum, pefilæum, &c. seem to be no more than productions of resinous substances united with mineral acids, which have caught fire in the earth by fermenting with heterogeneous matter, and have thus undergone a sort of natural distillation and exaltation. These are more than chimerical notions, and are even demonstrated by experiments; for amber can be produced artificially, as likewise bitumens by the distillation of resinous substances with mineral acids; and there is great probability, that pit-coal might be imitated. I am,

S I R,

Brussels, June 11,
1756.

Your most obedient and

obliged humble servant,

Edward Wright.

CVI. A Retraction, by Mr. Benjamin Wilson, F. R. S. of his former Opinion, concerning the Explication of the Leyden Experiment.

To the ROYAL SOCIETY.

Gentlemen,

Read June 24,
1756.

I Think it necessary to retract an opinion concerning the explication of the Leyden experiment, which I troubled this Society with

with in the year 1746, and afterwards published more at large in a Treatise upon Electricity, in the year 1750; as I have lately made some farther discoveries relative to that experiment, and the minus electricity of Mr. Franklin, which shew I was then mistaken in my notions about it.

What I mean by the minus electricity of Mr. Franklin, regards the minus electricity of the Leyden experiment only, which that gentleman discovered.

I shall be very glad to have this acknowledgment made public; and, to answer that end the most effectually, I wish it may have a place in the Transactions of the Royal Society.

I am,

Gentlemen,

London, June 24,
1756.

Your most obedient

humble servant,

Benj. Wilson.

CVII. An Account of the extraordinary Agitation of the Waters in several Ponds in Hertfordshire: In a Letter from the Rev. Thomas Rutherford, D. D. F. R. S. to the Rev. Samuel Squire, D. D. F. R. S.

Dear Sir,

Read July 1,
1756.

I Have lately had an opportunity of making some enquiries about an unusual motion of the water in a pond at Patmerhall; which is a farm in the parish of Albury, and county of Hertford. Mr. Thomas Mott, who is the occupier of the farm, tells me, that there are two ponds in his yard, which are parted from one another only by a causey, which is just wide enough to allow of a convenient passage for a waggon and driver: the causey runs from north to south; so that one of the ponds is to the west, and the other is to the east of it. At the western end of the former, which is the head of it, are two drains, one higher than the other, to carry off the waste water; and on each side, at the other end, close to the causeway, is a mouth, or opening, where his cattle go to drink. The pond itself is about eight roods over, and twelve roods long. The other pond is of the same size; except, that there is a dove-house in the middle of it, which stands upon a small island. On the first day of November last, between ten and eleven o'clock in the forenoon, his servants, who were then close to these ponds, heard a rumbling noise, like the wind;

wind ; and took notice, that three ducks, which were then in the western pond, immediately flew out of it into the other, as if they were affrighted. At the same instant the water in the western pond arose at the head of it, so as to run out of the lower drain, which was ten or twelve inches above the level. He did not see this swell of the water himself ; but his servants, who saw it, called him immediately ; and he found, that the water was then in motion ; and that it had run out of the drain. It continued to move backwards and forwards for some time ; but he observed, that it did not swell any more at the head, but only arose and fell by turns at the two mouths ; so that the motion was then from north to south. When it arose at either of the mouths, it flowed about six feet beyond what was then the water-mark. The other pond, during the whole time, was as calm and still, as he ever saw it ; nor had his servants observed any motion in it, unless what was occasioned by the alighting of the ducks.

Mr. Mott tells me farther, that Wickham-hall, which is another farm, about two miles and a half from him, in the parish of Bishop-Stortford, in the same county, a pond was moved at the same time in the same manner ; and that the first motion of it was from east to west. This account he had from a person, who saw it. He adds, that a like motion was observed in a pond at Thaxted, in the county of Essex : but of this he knows no particulars.

At Royston, in the county of Hertford, Mr. Newbell, an officer of the excise, observed an unusual motion in the pond, at ten o'clock in the fore-

noon, November 1, last past. The pond is a large one, and almost round. The bank of it, towards the north, is faced with a brick-wall; and the bottom of it arises from thence, in a slope, towards the south. The water arose from north to south, so as to go five feet and a half beyond the water-mark. In his return it arose against the brick wall, the top of which was about one foot above the level of the water, so as to run over it. The water afterwards moved from north to south, and back again, five times before it stopped. I am,

Barley, June 15,
1756.

Dear Sir,

Very faithfully yours,

T. Rutherford.

CVIII. *Some Considerations on a draught of two large peices of Lead, with Roman Inscriptions upon them, found several years since in Yorkshire.* By John Ward, LL.D. Rhet. Prof. Gresh. and V. P. R. S.

Read July 1,
1756. **S**OME time since a draught of two large peices of lead, similar to each other, was communicated to this Society by a worthy member, Henry Stuart Stevens, Esquire (1). The account then given of them, which accom-

(1) January 31, 1754.

panied the draught, was as follows: " They were
 " found in February 1734, one foot and half under-
 " ground, on Hayshaw Moor, belonging to Sir
 " John Ingilby, baronet, in the manor of Dacre,
 " near Pateley bridge, in the West Riding of York-
 " shire. The weight of each peice is one hun-
 " dred, one quarter, and sixteen pounds." The
 form of them, as likewise two Roman inscriptions
 impressed on them in relief, will appear by the
 draught annexed to this paper, and reduced to half
 the size of the original (Tab. xxiv.). The larger
 inscription, which is placed on the top, may be thus
 read in words at length :

Imperatore Caesare Domitiano Augusto, Consule VII.

And the lesser, on the side :

Brigantum.

When this draught came first before the Society, I
 took the liberty of saying, that I apprehended those
 peices of lead were part of the tax, which at that time
 was paid to the Romans out of the lead mines in Bri-
 tain. The reasons for which opinion I now beg
 leave to offer more at large (2).

(2) Since this paper was written, I have found, that another
 draught of those peices of lead, with a breif account of them, had
 formerly been communicated to the Society, not long after they
 were discovered ; and published in their *Transactions*, Vol. XLI.
 Num. 459. p. 560. That account differs very little from this, ei-
 ther as to the form, dimensions, and weight of the two peices of
 lead ; or the time, and place, of their discovery. But no attempt
 is there offered to explain the design, for which they were made.

But before I enter upon this, it may be proper to observe, that Camden has published two Roman inscriptions, impressed likewise on peices of lead, which were found on the shore, at the mouth of the river Mersey in Cheshire, while he was revising his description of that country, And the account he gives of them is this: *Dum haec recognovi, a fide dignis accepi viginti massas plumbeas hic in ipso litore erutas fuisse, forma oblongiori sed quadrata, in quarum superiori parte in concavo haec legitur inscriptio:*

IMP. DOMIT. AVG. GER. DE
CEANG.

In aliis vero:

IMP. VESP. VII. T. IMP. V.
COSS.

He supposes them to have been erected as a monument of a victory over the *Cangi*, as appears by his following words, which are these: *Quod monumentum videatur erectum fuisse ob victoriam in Cangos* (3). And this he supposes to have been done in the reign of Domitian, while *Julius Agricola* was *propraetor* in Britain. It is plain from the words, *a fide dignis accepi*, that Camden himself had not seen those

(3) *Britann.* p. 463, edit. 1607.

peices of lead. However from his description of them, as imperfect as it is (for he neither gives us their weight, nor dimensions) it seems highly probable, that they were of the same kind, and designed for the same use, with those represented by this draught. But as Camden considered them only as a monument of a victory, I shall now proceed to offer my reasons for differing from that learned writer in this particular.

At the time these peices of lead were cast, Britain was a Roman province, and had been so from the reign of *Claudius*. For *Caesar*, as Tacitus says, was the first Roman, who invaded Britain; but did little more, than show it to his successors. After which the civil wars, and dissensions in the Roman state, diverted them from any thoughts of Britain; so that no attempts were made against it during the three following reigns (4). But *Claudius*, who succeeded next to the empire, being ambitious of a triumph, was prevailed on to undertake an expedition against Britain. For this purpose he sent hither a large body of Roman forces, and not long after coming over himself landed in Kent. The Britons were then governed by several independent princes, who not being able to withstand the Romans, some of them submitted; and *Claudius* in a short time returning again to Rome, was honoured with a splendid triumph. And the army, which he left behind him, not only maintained what they had gotten, but advancing farther into the country enlarged their conquests; so that during the reign of *Claudius*, as Tacitus informs

us, *Redacta paulatim in formam provinciae proxima pars Britanniae, addita insuper veteranorum colonia, quaedam civitates Cogiduno regi donatae* (6). Where by the Words, *proxima pars Britanniae*, must be understood the south east parts nearest the continent (7).

From this time a Roman governor was usually appointed to reside here, as in other provinces of the empire. And in the next reign, which was that of *Nero*, the Romans continued to gain fresh conquests; though the Britons, who were very uneasy in this state of servitude, made several efforts to regain their liberty, and particularly under the conduct of queen *Boadicea*. When, as the same historian relates, Britain had been lost, if the Roman governor *Paullinus*, who was employed in the reduction of the isle of Anglesey, had not speedily returned, and given the enemy a total defeat (8).

After this no fresh disturbances arose till the reign of *Vespasian*, who assumed the empire near the end of the year 69. In the year 71 the Roman army under *Cerealis* having attacked the *Brigantes*, a northern people, and very numerous, conquered a great part of their country (9). And in the year 76 the *Silures*, inhabitants of Wales, a powerful and warlike people, were in like manner subdued by *Frontinus* (10).

The next Roman legate in Britain was *Julius Agricola*, a man of equal courage and prudence; who in the year 78, being sent by *Vespasian* to go-

(6) *Ibid. cap. 14.*

(7) See *Horsley's Brit. Rom. p. 33.*

(8) *Tac. ubi supra, cap. 16, 18.*

(9) *Tac. ibid. cap. 17.*

(10) *Ibid.*

vern the province, marched first against the *Ordovices*, a people of North Wales, by whom a body of Roman foldiers, ftationed near them, had lately been almoft intirely cut off; in return for which, having given them a total defeat, he deftroyed in a manner the whole nation (11). After this his view was to reduce the ifle of Anglefey, which upon his approach furrendered to him (12). And winter then coming on, he applied himfelf to redrefs the greivances of the inhabitants, and particularly the unjuft exactions made upon them by the officers of the revenue, in order to prevent any future difturbances. At the approach of fummer he drew out his army, and gave the enemy no reft, by making fudden inroads upon them, and wafting their country. And when he had fufficiently terrified them, he defifted, and fhewed them the allurements of peace; by which many ftates fubmitted, gave hoftages, received garrifons, and permitted the building of forts. The winter following was fpent in fchemes to foften and polifh this rude and uncultivated people, by encouraging and affifting them to build temples (13), places of public refort,

(11) *Ibid. cap.* 18. (12) *Ibid.* (13) The largeft and moft beautiful mofaic pavement, which has hitherto appeared in Britain, was difcovered fome years fince in Littlecote park, near Ramfbury in Wiltfhire, and now poffeffed by Edward Popham, efquire. It feems, by the form and fize of it, to have been the area of a heathen temple, confifting of two parts, as thofe buildings ufually did, namely, a *templum* and *facrarium*. And from fome coins of Vefpafian, which were found with it, that temple might not improbably have been one of thofe, which were erected here, while Agricola governed in Britain. A print of this curious remain of Roman antiquity was lately ingraven by Mr. George Vertue.

and

and fine houses ; the noblemens sons were instructed in the liberal arts, drawn into an esteem of the Roman language and habit, and by degrees the inducements to luxury, as porticos, baths, and costly banquets ; which, as the historian adds, *apud imperitos humanitas vocabatur, cum pars servitutis esset* (14). The third campaign discovered new people, when marching still northward he subdued all, who opposed him, to the borders of Scotland, where he built castles. And the next summer was employed in securing and settling the conquests, which he had hitherto made ; so that the Romans were then absolute lords of all on this side. The two succeeding years were employed in fresh conquests northwards, and the year following, or near it, *Agricola* was recalled by the emperor *Domitian*. Such was the state of affairs in Britain during the government of *Agricola*, when the Romans enjoyed the fruits of their conquests, and the Britons grew more easy under the yoke.

In the Roman provinces the next officer under the governor was the *procurator*, who had the care and charge of the revenues, and by illegal exactions often oppressed the inhabitants. This was one of the greivances complained of by the Britons, at the time of their revolt under queen *Boadicea*, when they said : *Singulos sibi olim reges fuisse, nunc binos imponi ; e quibus legatus in sanguinem, procurator in bona saeviret* (15). Now the taxes levied by the Romans on the provincials were of two kinds, called *tributa*

(14) *Tacitus, ibid. cap. 21.*

(15) *Ibid. cap. 15.*

and *veſtigalia* (16). The former conſiſted chiefly of a capitation tax, and a tax upon lands; both which, as occaſion required, had in the time of the republic been frequently levied on the citizens of Rome (17). All other duties beſides theſe came under the name of *veſtigalia*, and were principally four: a certain portion of the grain produced by arable land, which was uſually a tenth; payments made for grazing cattle in paſture grounds, or foreſts; cuſtoms upon goods imported, or exported; and the produce of mines (18). But this diſtinction, between the uſe of the words *tributum* and *veſtigal*, is not always obſerved by Roman writers. The *veſtigalia* were generally farmed out to Roman citizens of the equeſtrian order, who held them at a certain annual rent, and were called *publicani* (19). So Livy, ſpeaking of the mines in Macedonia, ſays: *Eas ſine publicanis exerceri non poſſe* (20). And as this affair was too large and expenſive for the fortune of ſingle perſons, it was managed by different ſocieties, or corporations, who rented one or more ſpecies of a whole province, which were let together. Tacitus refers to theſe ſocieties, when he ſays: *Frumenta, et pecuniae veſtigiales, cetera publicorum fructuum, ſocietatibus equitum Romanorum agitabantur* (21). And Cicero calls them *ſocietates veſtigilium* (22). They uſually reſided at Rome; but had

(16) *Cujac. Obſervat. Lib. vii. cap. 4.* (17) *Feflus in voc. Tributorum.* (18) *Burmam. De veſtigal. Lib. i. p. 3. and Lib. vi. p. 77. edit. 4to.* (19) *Leg. i. §. 1. Dig. de publican. et veſtigal. et commiſſ. Leg. 16. Dig. de verbor. ſignif.* (20) *Lib. xlv. cap. 18.* (21) *Annal. Lib. iv. cap. 6.* (22) *Pro Sext. cap. 14.*

deputies (23), and other inferior officers, in the provinces; who transacted their affairs there, and disposed of their effects.

Pliny observes, that the lead mines in Britain were in his time very large, and easily worked, as they lay near the surface of the earth. His words are these: *Nigro plumbo ad fistulas laminaeque utimur, laboriosius in Hispania eruto, totasque per Gallias; sed in Britannia summo terrae corio adeo large, ut lex ultro dicatur, ne plus certo modo fiat* (24). And then he proceeds to acquaint us with the annual rent, at which one of those mines was farmed in *Baetica*, the more southern province of farther Spain. *Mirum*, says he, *in his solis metallis, quod derelicta fertilius revivescunt. Nuper ita compertum in Baetica Santarense* (25) *metallo, quod locari solitum x. cc. m* (26) *annuis, postquam oblitteratum erat, cclv* (27) *locatum est.* The former of these sums makes of our money six thousand four hundred fifty eight pounds, six shillings, and eight pence; and the latter, eight thousand two hundred thirty four pounds, seven shillings, and six pence; computing the value of a Roman denary at seven pence three farthings, as Dr. Arbuthnot has done in his tables.

(23) *Zacchaeus* seems to have had this office in *Judaea*, as he is styled ἀρχιτελώνης, and said to have been rich; whereas St. *Matthew* is only called τελώνης. *Luke* xix. 2. *Matth.* x. 3. *Luke* v. 27.

(24) *N. H. Lib. xxxiv. cap. 17.* (25) *Santarense* was the name of the mine here spoken of, as *Harduin* has shewn in his notes upon this place. (26) That is, *denariorum ducentis*

millibus. (27) That is, *ducentis quinquaginta quinque milibus.*

What Pliny says of the lead mines in Britain, plainly relates to his own time, and shews they were then subject to a Roman tax. And as he lived to the year 80, or near it, that very well agrees with the dates of the several inscriptions on the peices of lead now under consideration. The earliest of these dates, which is in one of Camden's inscriptions, namely, IMP. VESP. VII. T. IMP. V. COSS. answers to the year 76, in the *Fasti Consulares*. And that in the draught, which is IMP. CAES. DOMITIANO. AVG. COS. VII. to the year 81 (28). And though the other inscription in Camden has only IMP. DOMIT. AVG. GER. without a date; yet, as the title *Germanicus* appears on some coins of *Domitian* at the be-

(28) With regard to this inscription, it may not be amiss to observe, that although Domitian held his seventh consulate in the year 80, as appears by the *Fasti*; yet, as he is here stiled *Augustus*, the inscription must refer to the year 81, in which he succeeded to the empire, upon the death of his brother Titus, and took the office of consul for the eighth time the following year. Nor are there wanting several other instances of the like nature, in which the last preceding consulate of the Roman emperors continued to be inserted in their inscriptions, among their other titles, till they resumed that office again. Thus *Occo*, p. 181, gives us an inscription of Trajan, with *Trib. potest.* 18, *Cof.* 6. Where the date of his tribunical power answered to that of his reign, which *Pagi* observes to have been the usual custom, *Proleg. ad Dissert. Hypat.* §. 6. But Trajan held his sixth consulate in the year 112, which was the fifteenth of his reign. So likewise in the *Append. ad Marm. Oxon.* N. 162, there is a Greek inscription of Hadrian, with Διμαρχικῆς ἐξουσίας τὸ δ', ὑπατον τὸ γ'. that is, *Trib. pot.* 10, *Cof.* 3. Though Hadrian's third consulate was in the same year of his reign. And to mention no more, *Fabretti*, p. 451, has published an inscription of the same emperor, in which is, *Tribuniciæ potest.* 19, *Cof.* 3, being but two years before his death.

gining of his reign, before he assumed it as a *cognomen* (29), it is not improbable, that this peice of lead might also have been cast within the time, when *Agricola* was governor of Britain.

The method of casting the lead, when separated from the ore, into large peices of a proper size, form, and weight, was very proper; as well to ascertain their quantity, as to render them portable, and fit for sale. And they might be marked with the name of the emperor for a like reason, as when it was put upon the coins; namely, to authorise the sale of them by vertue of his permission. The year likewise, and the name of the people, where the mines lay, were necessary to be added, for the sake of the proprietors; in order to adjust their accounts with the officers, and prevent frauds in the execution of their trust. And it is observable, that the method now made use of in our lead mines is not much different from this. For the metal, while liquid, is cast in an iron mold into large peices, which from the shape of them are usually called *pigs*; and, as I have been informed, are upon an average near the same weight, with that specified in the draught. And they are likewise commonly marked with the initial letters of the name of the smelter, or factor, and sometimes both, before they are sent from the mines.

Camden might possibly take these peices of lead for the monument of a victory, by supplying *Victoria*, or *monumentum victoriae*, before the words *DE CEANG.* for *Ceangis*; the same people, as he sup-

(29) See *Vailant, Numism. imp. Rom. praestant. Tom. II. ed. 3. p. 113.* And *Sueton. in vit. Domit. c. 13.*

poses, with the *Cangi*; and whom, from the authority of this inscription, he would place in that country. But this supplement will not answer, when applied to *Brigantum*, the name of the people mentioned in the inscription upon the draught. For *viçtoria*, or *monumentum viçtoriae*, *Brigantum*, would rather mean *a viçtory gained by the Brigantes*, than *over them*. I would therefore supply the word *veçtigal* in both inscriptions, and read *veçtigal de Ceangis*, and *veçtigal Brigantum*; for the sense will be much the same in either construction, as the former will signify *a tax levied on the Ceangi*, and the latter *a tax paid by the Brigantes*. Horsley indeed questions the genuineness of these inscriptions in Camden; partly from his assigning this situation to the *Cangi* upon their authority, which he can by no means agree to; and partly from their giving the title *imperator* at the same time, as he apprehends, to *Vespasian*, *Titus*, and *Domitian* (30). But neither of these reasons appears sufficient to invalidate their authenticity. For as to the situation of the *Cangi*, concerning which our antiquarians differ very much in their sentiments, the finding of those peices of lead at the mouth of the river Mersey in Cheshire, is no proof of their having been made in that country. As twenty of them were found together, it seems highly probable, they were the remains of the cargo of some vessel laden with them, which had been cast away on that shore; but the place from whence they were brought must remain uncertain, till the situation of the *Cangi* has been first settled. Be-

(30) *Britann. Rom.* pag. 34, 316.

fides, the name of the people is not mentioned in one of those in Camden; which might then have been defaced, or omitted by the transcriber. And as to the other objection of Horsley, from the title of *imperator* being given to *Vespasian*, *Titus*, and *Domitian*, at the same time, in those two inscriptions; that the peices of lead, which contain them, must have been cast at some years distance from each other, has been shewn already (31).

As to Camden's description of them, as *monumentum erectum ob victoriam in Cangos*, if from their number he supposed them to have been set together in the form of a trophy; how they could well have been placed in such a situation, I do not apprehend; nor have I ever met with any instance of a similar nature. He mentions indeed another inscription upon lead, found near Ochie hole in Somersetshire, of which he gives the following account: *Non procul ab hoc, regnante Henrico VIII, aratro eruta fuit oblonga plumbi lamina in trophæum olim erecta, et sic inscripta:*

TI. CLAVDIVS CAESAR AVG. P. M.

TRIB. P. VIIII. IMP. XVI. DE BRITAN (32).

The size of the lead is not here given; but as he calls it *lamina*, a plate, that might indeed be fixed up somewhere, as a sort of trophy, or monument. Which seems confirmed by a coin of that emperor,

(31) *Pag.* 695.

(32) *Britann. pag.* 168. *edit.* 1607. A more particular account of this may be seen in Leland's *Affertio Arturii*, p. 45. where the inscription is read somewhat differently.

with the same inscription, and a triumphal arch on the reverse, as Camden observes; who places it in the year 50, which answers to the ninth tribuneship of Claudius. And the like may be said of another such inscription upon a peice of lead, weighing about fifty pounds, and found in the same county; which is published by Horsley, and is as follows:

IMP. DVOR. AVG. ANTONINI
ET VERI ARMENIACORVM (33).

It was then in the library of the lord viscount Weymouth at Longleat (34); though upon inquiry I do not find, that it is there now (35). But it was not unusual with the antients to cut inscriptions sometimes on tables of lead. Thus Tacitus saies: *Reperiebantur solo ac parietibus erutae humanorum corporum reliquiae, carmina et devotiones, et nomen Germanici plumbeis tabulis insculptum* (36). And Dion, speaking of the same subject, calls them, ἐλασμοὶ μόλις δεινοί (37). However, those large and thick masses of lead described by Camden, and represented by the draught, seem to have differed no less from these.

(33) *Brit. Rom. Somersetsh. num. x.* (34) *Ibid. pag. 328.*

(35) The Rev. Dr. Stukeley has since obliged me with a more particular account of this plate of lead, as it was communicated to him by the Right Honourable Heneage Earl of Winchelsea. The Doctor saies, it was one foot nine inches long, two inches thick, three and a half broad; weighed fifty pounds; and was found in the ground of the Lord Fitzharding, near Bruton in Somersetshire. A draught of which, with the inscription, may likewise be seen in his *Itinerar. Curios. p. 143.*

(36) *Annal. Lib. II. cap. 69.*
edit. Leunclav.

(37) *Lib. LVII. pag. 615.*

plates or tables, in the use of them, than they did in their figure. Nor can I apprehend, the former were designed for any other purpose, than that above mentioned. But as they are very remarkable, and perhaps the singular remains of that kind, relating to the Roman government, either here in Britain, or any other part of their dominions; they may deserve the further consideration of the curious, in their inquiries into these subjects.

CIX. *Two Essays addressed to the Rev. James Bradley, D. D. and Astron. Reg. by Mr. Charles Walmesley, F. R. S.*

Reverend Sir,

Read Nov. 4, 1756. I HAVE taken the liberty to address to you two little essays, that relate to astronomy; for as no one is more master of that science, or has enriched it with greater discoveries, than yourself, you can best judge of the worth and use of any performance in that kind. The first essay is a Theory on the Precession of the Equinoxes, and the Nutation of the Earth's Axis; which, as it is indebted to you for the discovery of the cause, on which it is founded, as also for the settling of the effects, with which its result is to be compared, ought to be laid before you as a homage, that of right is due. You expressed a desire of a theory on that subject: I have therefore examined, according to the *principle of gravity*, what motions may be produced in the globe

globe of the earth by the actions of the sun and moon, and have endeavoured to determine their precise quantity and laws of variation. You observed yourself, that the supposition you made use of, of the earth's pole moving round the periphery of a circle, whose center represented the mean place of the pole, was not exact: and in effect, as theory shews there are two equations arising from the sun's action, and as many from the action of the moon, to be used in settling the true place of the pole, the simple motion in the circle cannot answer accurately to the composition of these several motions; and it is from thence proceeded that surprizing difference you found betwixt the polar distances calculated on that supposition, and those observed, in the star α *Cassiopea*, in the year 1738, and in γ *ursæ majoris* in the year 1740 and 1741; which distances, if computed from the theory, as here laid down, agree with the observations as nearly as the others. This appears in the tables that are added of these computations. You also insinuated it would be proper to examine, whether the position of the moon's apogee had not a share of influence in these apparent motions of the stars. I therefore considered that point, but found, as you will see in the fifth proposition, that the diminution of the moon's action in the higher part of its orbit is so compensated by the increase of the same action in the lower part, that in the whole revolution of the moon no alteration arises, whatever be the situation of the nodes.

The second essay is a Theory of the Irregularities, that may be occasioned in the annual Motion of the Earth by the Actions of Jupiter and Saturn. I was

led into this research by reflecting upon that question, debated among the astronomers for so many ages past, whether the mean inclination of the two planes of the ecliptic and equator suffers any change or remains invariable. Considering then what cause could produce a change in this inclination, I easily conceived, that if the action of Jupiter had sufficient power to alter the plane of the earth's orbit, with respect to its own, by making their common intersection recede, in the same manner as the sun's action operates on the lunar orbit, an alteration in the obliquity of the ecliptic would necessarily follow; and upon closer examination it appeared, that Jupiter really caused the earth to deviate in its course, and gave a retrograde motion to the line of intersection of their orbits; and further, that according to the present situation of that line, its regress was such, as to have occasioned a gradual diminution in the obliquity of the ecliptic for many ages past: by which means that question seems decided. The reason, why the astronomers have not hitherto been able to settle that point, is, because this variation proceeds at so slow a rate, that the observations of the ancients are not sufficiently exact to ascertain the small diminution, that has happened since their time. I have endeavoured to fix the laws, quantity and period of this variation. From the same cause are also computed a progressive motion occasioned in the earth's aphely, and a small regressive one in the equinoctial points: in all which is added the little share of influence, that belongs to Saturn. In the last proposition are deduced some inequalities, that occur in certain elements of the earth's theory, that have hitherto been supposed

supposed invariable. These, as they are very small, I have only added in that view, that you, who know the best what degree of precision may be expected from astronomical observations, may judge whether they are worth notice or not.

I must observe, that some of the points of these two treatises have been considered by others; and if my conclusions any where differ from them, I leave it to other geometers to decide which are right. All I shall say on that head is, that my result agrees with the computation of the great Sir Isaac Newton. As to the method, I have rather chosen to deduce the propositions by geometrical reasoning, after the manner of Sir Isaac Newton; which in researches of this kind always appeared to me much more simple, more rational, and more elegant, than the long calculus of an intricate analysis. Besides, if in the application there slips any error, it is more easily discovered in the first method.

As a lover of the sciences, I should be glad to contribute to their improvement; but, whether what is here offered may be reputed a step that way, is left intirely to your determination. I am, with the greatest respect,

Reverend Sir,

Your most obedient

humble servant,

Charles Walmesley.

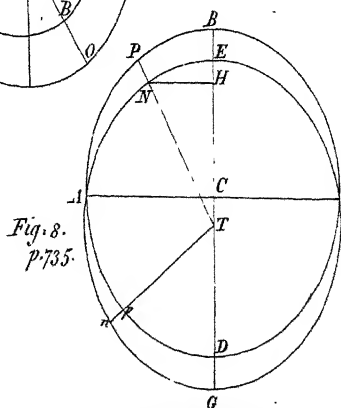
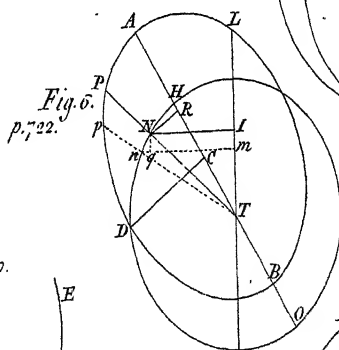
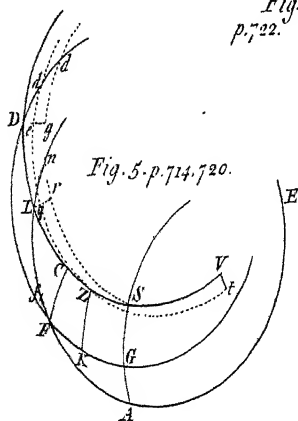
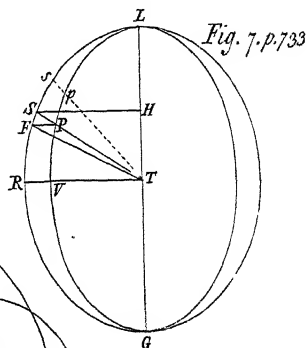
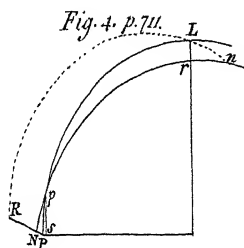
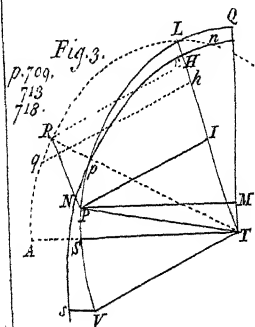
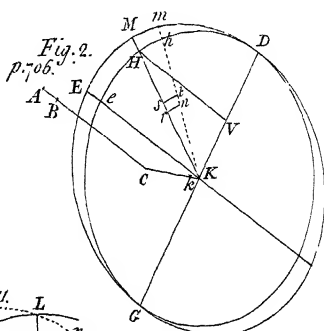
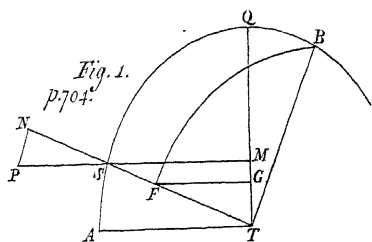
Rome, Dec. 3.
1756.

*De Præcessionē Æquinoctiorum et axis Terræ
Nutatione.*

LEMMA I.

INvenire vim, quâ Sol agit in partes Æquatorias Terræ.

Esto T (Fig. 1.) centrum Terræ, B polus, AT recta jungens centra terræ et solis, ASQ circulus centro T descriptus et perpendicularis Æquatori quem exhibet linea TS , et TQ linea intersectionis circuli $TASQ$ et plani plano Eclipticæ perpendicularis: per punctum Æquatoris S ducatur SM parallela rectæ AT occurrens TQ in M , et producat ad P ut sit $SP = 3 SM$, et ex P agatur PN perpendicularis in planum Æquatoris TS . Tum ob similitudinem triangulorum STM , SPN , erit $ST.MT :: SP$ five $3 SM$. $PN = \frac{3 SM \times MT}{ST}$. Sed notum est, quod, si radius terræ ST exhibeat vim, quâ sol deprimit particulam S versus centrum T , $3 SM$ exhibebit vim, quâ eandem particulam retrahit à plano, quod est plano Eclipticæ perpendiculari, adeoque $\frac{3 SM \times MT}{ST}$ exhibebit vim PN , quâ perturbatur situs plani Æquatoris, et efficacia hujus vis ad convertendum Æquatorem est ut $PN \times ST$, id est, ut ipsa vis PN . Vis autem ST est ad vim, quâ Terra retinetur in orbe suo circa solem, ut semidiameter terræ ST ad distantiam terræ à sole; et vis, quâ terra retinetur in orbe suo est, ad vim centrifugam in terræ æquatore in ratione compositâ ex ratione directâ distantie terræ à sole ad semidiametrum terræ et ratione inversâ duplicata



plicatâ temporis periodici terræ circa solem ad ejusdem tempus periodicum circa axem suum : unde per compositionem rationum, scribendo S pro periodo terræ annuâ et T pro periodo diurna, prodit vis PN ad vim centrifugam in terræ Æquatore ut $\frac{3SM \times MT}{S\bar{T}^2} \times \frac{TT}{SS}$ ad 1. Patet autem vis PN conatum

hunc esse, ut convertat æquatorem circum axem plano $TAS \mathcal{Q}B$ perpendiculararem, id est, circum axem qui jacet in communi sectione æquatoris et plani $\mathcal{Q}T$ Eclipticæ perpendicularis.

Ad æquales à puncto S in circumferentiâ æquatoris distantias sumantur puncta duo F , et quia horum utriusque vis conatur æquatorem convertere circum axem plano TFB respectivé perpendiculararem, conatus ex utraque vi compositus concurret cum vi prædictâ PN ad convertendum æquatorem eique in hærentem terram circum axem plano $TAS \mathcal{Q}$ perpendiculararem. Ducantur autem rectæ FG perpendiculares in planum $\mathcal{Q}T$ eclipticæ perpendicularare, et summa virium, quibus istæ duæ particulæ fugiunt planum æquatoris, erit $\frac{6FG \times TG}{F\bar{T}}$, ut patet ex dictis, cujus pars, quæ conspirat cum prædictâ vi PN , cum fit ad $\frac{6FG \times TG}{F\bar{T}}$ ut $F\bar{T}$ ad $S\bar{T}$, erit $\frac{6FG \times TG}{S\bar{T}}$ (reliquis harum virium partibus utpoté oppositis se mutuò destruentibus) five ob similitudinem triangulorum FGT et SMT , hæc summa erit ad vim PN ut $2\overline{F\bar{T}^2}$ ad $\overline{S\bar{T}^2}$; proindeque, cum summa omnium $\overline{F\bar{T}^2}$ per totam circumferentiam fit subdupla summæ totidem $\overline{S\bar{T}^2}$, erit summa actionum omnium

nium per circuitum æquatoris subdupla summæ totidem actionum in particulam S : quamobrem vis ea, quâ perturbatur situs circuli æquatoris, ex viribus punctorum omnium circumferentiam æquatoris constituentium collecta, est ad vim centrifugam in eodem æquatore, ponendo radium terræ $ST=1$, ut $\frac{3SM \times MT}{2} \times \frac{TT}{SS}$ ad 1. \mathcal{Q} . *E. I.*

LEMMA II.

Vis particularum omnium extra terræ globum interiore, cujus scilicet diameter est terræ axis minor, undique sitarum ad terram circum axem prædictum rotandam est ad vim particularum totidem in circuitu circuli æquatoris uniformiter in morem annuli dispositarum ad terram circa eundem axem movendam ut 2 ad 5. Luculenter demonstratur apud *Newtonum*.

LEMMA III.

Rationem motûs terræ totius ad motum materiæ supra globum terræ interiorem stratæ determinare.

Exhibeat C centrum terræ, (Fig. 2.) CK portionem diametri cujusvis æquatoris, $EDGK$ sectionem terræ diametro CK et plano æquatoris perpendicularem; sectio hæc et sectiones omnes huic parallelæ ellipses sunt ut notum est, et sibi similes. Ex centro K ellipseos EDG ducatur in plano æquatoris radius KE , eritque ellipseos semiaxis major, et radius huic perpendicularis KD semiaxis minor; ducantur item radii alii duo KM , Km sibi proximi, et centro K et radio KD describatur circulus DHe secans Km , KM , KE , in b , H , e ; et radio quolibet
 Kr

Kr describatur arcus rn secans KM , Km , in r , n , et arcus st arcui rn proximus secans KM , Km , in s , t . Jam quoniam areola $rstn$, dum terra revolvi-
tur circa axem CK , fertur velocitate distantiae Kr proportionali, motus ejus proportionalis erit $Kr \times rs \times st$ five $\frac{\overline{Kr}^2 \times Hh \times rs}{KH}$; unde motus areæ totius KMm

proportionalis erit $\frac{\overline{Km}^3 \times Hh}{3KH}$. Agatur HV perpen-
dicularis in KD , et si femiaxis major KE parùm
excedere supponatur femiaxem minorem KD , erit

$$HM = \frac{\overline{HV}^2 \times Ee}{KH^2} \text{ quam proximè, adeoque } \frac{\overline{KM}^3 \times Hh}{3KH} =$$

$$\frac{\overline{KH}^2 \times Hh}{3} + \frac{\overline{HV}^2 \times Hh \times Ee}{KH}, \text{ ac proinde summa motuum}$$

arcarum omnium KMm , id est, motus totius secti-
onis erit proportionalis circumferentiæ DHD ductæ

$$\text{in } \frac{\overline{KH}^3}{3} + \frac{KH \times Ee}{2}. \text{ Sit autem } CA \text{ æqualis semidia-}$$

metro terræ majori, CB semidiametro minori, et
 AB semidiametrorum differentiæ; sit Kk particula
quàm minima axis CK , et C denotet circumferen-
tiam æquatoris; tùm, quia est $KH.KE::CB.$
 CA , et $Ee.AB::KE.CA$, erit motus portionis
sphæroidicæ, cujus crassities est Kk , duabus sectio-
nibus parallelis terminatæ, hoc est, circumferentia

$$DHD \text{ ducta in } Kk \times \frac{\overline{KH}^2}{3} + \frac{KH \times Ee}{2} \text{ proportionalis}$$

$$\text{quantitati } \frac{C \times \overline{CB}^3 \times \overline{KE}^3 \times Kk}{3CA^4} + \frac{C \times \overline{CB}^2 \times \overline{KE}^3 \times AB \times Kk}{2CA^4},$$

adeoque summa horum motuum five motus to-
tius

tius sphæroidis circum axem CK exponetur per $\frac{CC \times \overline{CB}^3}{16CA} + \frac{3CC \times \overline{CB}^2 \times AB}{32CA}$ vel, si D designet circumferentiam radio CB descriptam, per $\frac{DD \times CA \times CB}{16} + \frac{3DD \times CA \times AB}{32}$. Hincque motus globi interioris, cuius radius est CB , exponetur per $\frac{DD \times \overline{CB}^2}{16}$: adeoque est motus globi interioris ad motum terræ totius circum axem CK gyantis ut \overline{CB}^2 ad $CA \times CB + \frac{CA \times 3AB}{2}$ five ut $CA - 2AB$ ad $CA + \frac{AB}{2}$ quamproximè, et motus materiæ globo terræ interiori incumbentis ad motum terræ totius ut $5AB$ ad $2CA$ quamproximè. *Q. E. I.*

COROLL.

Eadem ratiocinandi methodo, si circumferentia circuli radio CB descripti revolatur circa diametrum propriam, cum motus cuiusvis puncti circumferentiæ fit ut ipsius distantia ab hac diametro, motus totius circumferentiæ exponetur per $4\overline{CB}^2$: unde, si loco circumferentiæ substituatur annulus tenuissimus, erit motus annuli ad motum globi cuius semidiameter est CB , ut $4\overline{CB}^2$ ad $\frac{DD \times \overline{CB}^2}{16}$; hoc est, in ratione composita, ex ratione materiæ in annulo ad materiam in globo, et ratione duorum quadratorum ex diametro ad tria quadrata ex arcu quadrantali circuli, quemadmodum demonstravit *Newtonus*. Atque hoc pacto si semidiameter terræ minor fit ad maiorem ut 229 ad 230, et tota materia supra globum terræ
interiorem

interiorem diffusa coalescere intelligatur, uti supponit *Newtonus*, in anulum uniformem, qui æquatorem cingat, erit motus annuli ad motum globi interioris ut 4590 ad 485223, et motus annuli ad motum terræ totius ut 4590 ad 489813.

Hic autem advertere liceat proportionem hanc motuum, quæ nempe derivatur ex hypothesi, quod tota materia globo terræ interiore superior in anulum circum æquatorem coalescat, à verâ paululum aberrare: patet enim singulas materiæ particulas in locis suis consistentes non ipsum eundem concipere motum ex terræ rotatione, quem sortirentur, si juxta hypothesim illam in æquatore simul collectæ subsisterent. Differentiam illam motuum, quia minuta est, in investigatione præcessionis mediæ æquinoctiorum, ut minùs consideratione dignam, omisit *Newtonus*. At quoniam nunc temporis, ob nova Astronomiæ inventa, accuratius inquiritur proportio virium Solis et Lunæ, earundemque effectus proprii, differentiæ istius habere rationem operæ pretium videtur, atque ea propter lemma hoc subjunximus et in propositione sequenti usurpabimus.

PROPOSITIO I. PROBLEMA.

Investigare Præcessionem mediam Æquinoctiorum vi solis genitam. Designet SPQ (Fig. 3.) Æquatorem terræ, ARL Eclipticam, TL lineam intersectionis planorum æquatoris et eclipticæ PM perpendiculum demissum ex puncto æquatoris P in planum QT quod supponitur eclipticæ perpendiculare. Sumpto arcu quam minimo æquatoris Pp , sit PN duplum spatii, quod corpus percurrere posset perpendiculariter ad æquatorem, impellente vi in lemmate 1^o. definitâ, quo tempore punctum p cum æquatore revol-

vens describit arcum pP , atque hoc pacto post illam particulam temporis planum æquatoris translatum reperietur in situm $TNpn$, ac jam eclipticam secabit in n , eritque arcus Ln recessus intersectionis æquatoris et eclipticæ five præcessio æquinoctiorum. In Npn demittatur perpendicularum Lr , et in TL perpendicularum PI , et cum lineæ PN , Lr , sint ut sinus arcuum Pp , PL , erit $Pp.PN :: PI.Lr$, et scribendo B pro sinu et C pro cosinu inclinationis eclipticæ ad æquatorem ad radium 1, in triangulo rectangulo Lrn habetur $B.1 :: Lr.Ln$, adeoque fit $Pp \times B.PN :: PI.Ln$, et $Ln = \frac{PN \times PI}{B \times Pp}$: dato igitur arcu Pp , est Ln ut $PN \times PI$. Centro T describatur arcus circuli RP perpendicularis in æquatorem LP , eritque in triangulo sphærico LRP tangens anguli RLP . inclinationis scilicet eclipticæ ad æquatorem, ad tangentem arcûs RP , id est, erit $\frac{B}{C}$ ad $\frac{MT}{PM}$, ut radius 1. ad PI sinum arcûs PL , unde erit $PI = \frac{C \times MT}{B \times PM}$. Item in eodem triangulo est B ad 1 ut MT ad RH sinum arcûs eclipticæ RL , hoc est, $MT = B \times RH$. Insuper est PN ut $PM \times MT$ ex lem: 1°; quare est $PN \times PI$ adeoque et Ln ut \overline{RH}^2 , hoc est præcessio horaria æquinoctiorum vi solis genita est in duplicatâ ratione finis distantie solis ab Æquinoctio. Et quoniam summa omnium \overline{RH}^2 , quo tempore sol periodum suam absolvit, est dimidium summæ totidem \overline{TR}^2 , ideò præcessio annua æquinoctiorum est subdupla ejus, quam sol in quadraturis Æquinoctiorum, hoc est, in solstitiis semper manens eodem tempore generare possit.

Sit

Sit igitur sol in Coluro Solstitiali, eruntque LP et LR (Fig. 4.) quadrantes circuli, et Lr mensura anguli Lpn five PpN ; hincque in triangulo Lrn est Ln five præcessio horaria æquinoctiorum in hoc casu ad Lr five ad angulum Ppn ut 1 ad B : est autem angulus PpN , ducto perpendiculo ps in radium TP , ad duplum angulum Pps , id est, ad angulum PTp qui est motus horarius terræ circa axem suum ut vis quæ agit secundum PN ad vim centrifugam in æquatore, hoc est, per lemma 1, ut $\frac{3SM \times MT}{2} + \frac{TT}{s^2}$ Fig. 1. ad 1; five quia est in hoc casu $MT = B$, et $SM = C$; ut $\frac{3B \times C}{2} \times \frac{TT}{s^2}$ ad 1; estque motus horarius terræ circa axem suum ad motum horarium solis ut S ad T : unde conjunctis rationibus est præcessio horaria Æquinoctiorum ad motum horarium solis ut $\frac{3C}{2} \times \frac{T}{s}$ ad 1, et in eadem ratione est præcessio annua ad motum solis annum.

Præcessio igitur annua Æquinoctiorum, in hypothefi quod sol toto eo tempore staret immotus in solstitio, foret $\frac{3C}{2} \times \frac{T}{s} \times 360^\circ$, et vera præcessio annua foret hujus subdupla. Sed quia Sol agit non tantum in circulum æquatoris, ut in hac propositione hucusque supposuimus, sed in totam materiam supra globum terræ interiorem sparsam, et globus ipse motum hac vi genitum participare debet, ideò minuenda est præcessio in ratione compositâ, ex ratione 2 ad 5 per lemma 2, et ex ratione 5 AB ad 2 CA per lemma 3; quare præcessio annua Æquinoctiorum à vi solis oriunda tandem prodit $\frac{3C}{4} \times \frac{T}{s} \times \frac{2}{5} \times \frac{5AB}{2CA} \times 360^\circ$

$$\times 360^\circ = \frac{3G}{4} \times \frac{T}{S} \times \frac{AB}{CA} \times 360^\circ.$$

Sit igitur diameter terræ major ad minorem ut 230 ad 229, eritque $\frac{AB}{CA} = \frac{1}{230}$, et, existente inclinatione Eclipticæ ad Æquatorem $23^\circ. 28'. 30''$. præcessio æquinoctiorum annua vi solis prodit $10'', 583$. Sit ratio 178 ad 177 illa terræ diametrorum, qualem ex recentioribus quidam derivarunt observationibus, eritque $\frac{AB}{CA} = \frac{1}{178}$, et præcessio æquinoctiorum annua $13'', 675$.

Si motûs communicatio inter globum terræ interiorem et materiam exteriorem fiat secundum hypothesim *Newtonianam*, quemadmodum expositum est in Coroll. lem 3, et diameter terræ major fuerit ad minorem ut 230 ad 229, annua æquinoctiorum præcessio ex vi solis erit $\frac{3G}{4} \times \frac{T}{S} \times \frac{2 \times 4590}{5 \times 489813} \times 360 = 9'', 124 = 9''. 7'''. 26^{iv}$. Et si inclinatio Eclipticæ ad æquatorem supponatur esse $23^\circ \frac{1}{2}$, præcessio illa evadit $9''. 7'''. 20^{iv}$, uti invenit *Newtonus*. *Q. E. I.*

COROLL. I.

Ponatur cum *Ill. Bradleio* Præcessio annua Æquinoctiorum mediocris tota æqualis $50'', 3$; atque ex eâ auferantur $10'', 583$ et remanebunt $39'', 717$ pro præcessionem annuâ mediocri â vi lunæ oriundâ, eritque vis lunæ ad vim solis ut 3,753 ad 1, in hypothesi, quod ratio diametrorum terræ sit $\frac{230}{229}$; si verò hæc ratio statuatur æqualis $\frac{178}{177}$: terrâ manente uniformiter densâ, ex $50'', 3$ auferantur $13'' 675$, eritque præcessio

præcessio annua vi lunæ genita $36'',625$, et vis lunæ ad vim solis ut $2,678$ ad 1 .

COROLL. II.

Sumatur jam in Eclipticâ arcus Rq (Fig. 3.) quem sol dato tempore quam minimo, v. g. horæ spatio, describit, et ductâ qb parallelâ rectæ RH , quia est ex dictis in propositione præcessio Æquinoctiorum horaria, existente sole in loco quovis R , ad præcessionem mediocrem horariam ut \overline{RH} ad $\frac{\overline{TR}}{2}$ five, cum sit $RH. TR :: Hb. Rq$, ut $RH \times Hb$ ad $\frac{TR \times Rq}{2}$, erit præcessio vera ad præcessionem mediam, quo tempore sol describit arcum LR , ut spatium LRH ad sectorem LTR , et differentia earum ad præcessionem mediam ut triangulum TRH ad sectorem LTR : ideòque, existente $LR = 45^\circ$, id est, in Octantibus Æquinoctiorum cum sole hæc differentia five æquatio, quæ tunc maxima evadit (scribendo D pro circumferentiâ circuli cujus radius est 1) est æqualis $\frac{10'',583}{2D}$ vel $\frac{13'',675}{2D}$, unde emergit Theorema sequens: *Est motus solis ad motum Æquinoctiorum vi solis genitum, ut radius ad sinum duplæ æquationis æquinoctiorum maximæ.* Hoc pacto in priori casu prodit æquatio maxima $51'''$, in posteriori $1'.5'''$. In aliis locis hæc æquatio est ad æquationem maximam ut sinus duplæ distantie solis ab Æquinoctio vel Solstitio proximo ad radium, ut patet: et additur motui medio ubi sol transit à Solstitiis ad Æquinoctia, et subducitur ubi sol pergit ab Æquinoctiis ad Solstitia.

COROLL.

COROLL. III.

Ex propositione generatim sequitur regressum horarium mediocrem lineæ intersectionis planorum *Æquatoris Terrestris* et *Orbitæ planetæ* cujuscunque circa terram revolvantis esse ut vis illius planetæ in globum terraqueum, cæteris manentibus, et cosinus inclinationis ejus orbitæ ad terræ æquatorem, conjunctim.

PROPOSITIO II. PROBLEMA.

Invenire inæqualitatem Præcessionis *Æquinoctiorum*, quæ pendet à vario situ *Nodorum Lunæ*.

Sunto *SLD* (Fig. 5.) *Æquator*, *EAF* *Ecliptica* fecans *Æquatorem* in *L*, *E* *Æquinoctium* vernum, *L* autumnale, *GFD* orbis lunæ fecans *æquatorem* in *D* et *eclipticam* in *F*, *AGS* circulus maximus perpendicularis in *Æquatorem*, et sunt *SD*, *GD* quadrantes circuli. Dum Nodus *F* describit arcum horarium *eclipticæ Ff*, vi lunæ transferatur intersectio *D* per arcum *Dd*, et describatur circulus *Sd* exhibens situm *æquatoris* post horam elapsam, fecetque *Eclipticam* in *n*, et ducantur in *æquatorem* perpendiculara *Dg*, *Lr*. Est *b* sinus ad radium 1 et *c* cosinus inclinationis, eo tempore, orbis lunaris ad terræ æquatorem; existente, ut prius, *B* sinu et *C* cosinu inclinationis *Eclipticæ* sive inclinationis mediocris orbitæ lunaris ad *Æquatorem*: Eritque (per Coroll. 3. prop. præced.) regressus horarius mediocris intersectionis planorum *Æquatoris* et *Eclipticæ* vi lunæ genitus ad *Dd*, regressum scilicet mediocrem horarium intersectionis planorum *Æquatoris* et orbitæ

bitæ lunaris, ut C ad c ; est autem Ff ad regressum prædictum intersectionis planorum Æquatoris et Eclipticæ ut motus medius nodorum lunarium ad motum medium Æquinoctiorum vi lunæ genitum, quam rationem pono esse K ad 1 ; est ergo $Ff. Dd:: C \times K. c$; sed est $Dd. Dg:: 1. b$, et $Dg. Lr:: 1$ ad finem arcûs LS quem voco k , estque $Lr. Ln:: B. 1$; under per compositionem rationum fit $Ff. Ln:: B \times C \times K. b \times c \times k$.

Per nodum F describatur arcus circuli maximi FC perpendicularis in SL , et ex principiis Trigonometriæ Sphæricæ est $\text{Cof. } FL$ ad radium 1 ut $\text{Cotang. } FLC$ ad $\text{Tang. } LFC$; deinde est $\text{Sin. } LFC$ ad $\text{Sin. } DFC$ ut $\text{Cof. } FLC$ ad $\text{Cof. } FDC$: cum autem angulus DFC sit summa angulorum DFL et LFC , est $\text{Sin. } DFC = \text{Sin. } DFL \times \text{Cof. } LFC + \text{Cof. } DFL \times \text{Sin. } LFC$. Quo pacto, scriptis p pro sinu et q pro cosinu anguli DFL , inclinationis nimirum mediocris orbitæ lunaris ad Eclipticam , et v pro sinu et u pro cosinu arcûs EF , distantiae scilicet nodi ab Æquinoctio verno, habebitur $\text{Cof. } FDL = c = Cq + Bpu$. Item in triangulo FDL est $b:p::v:\text{Sin. } DL$, adeòque est cosinus arcûs DL sive sinus arcûs LS , hoc est, $k = \frac{1}{b} \sqrt{b^2 - p^2 v^2} = \frac{1}{b} \times Bq - Cpu$.

Hinc ergo obtinetur $b \times c \times k = Cq + Bpu \times Bq - Cpu = BCq^2 - \overline{C^2 - B^2} \times pqu - BCp^2u^2$, sed scribi potest 1 pro q et rejici terminus BCp^2u^2 ob exiguitatem p sinûs scilicet anguli $5^\circ. 8' \frac{1}{2}$. Quaré est Ln ad Ff ut $BC - \overline{C^2 - B^2} \times pu$ ad $B \times C \times K$, et summa motuum Ln ad summam motuum Ff , quo tempore nodus F describit arcum EF , ut summa quantitatuum

titatum $BC - C^2 - B^2 \times pu$ ad summam totidem $B \times C \times K$, hoc est, ut $B \times C \times EF + C^2 - B^2 \times pv$ ad $B \times C \times K \times EF$, atque adeò quo tempore nodus transít ab Æquinoctio ad Solstitium præcessio æquinoctio-

rum fit $\frac{90^\circ}{K} + \frac{C^2 - B^2 \times p \times 90^\circ}{B \times C \times K \times EA}$, et quo tempore transít nodus ab uno Æquinoctio ad alterum, præcessio fit $\frac{180^\circ}{K}$. Ex priori motu auferatur posterioris dimi-

dium et remanebit $\frac{C^2 - B^2 \times p \times 90^\circ}{B \times C \times K \times EA}$ pro differentiâ inter præcessionem veram et mediam, id est, pro æquatione maximâ præcessionis ubi nodi lunares scilicet versantur in punctis solstitialibus: in aliis locis patet hanc æquationem esse ad æquationem maximam ut finis distantiae nodi ab Æquinoctio ad radium, et additur præcessioni mediæ in regressu nodi ascendentis ab Æquinoctio Verno ad Autumnale, et subducitur in ejusdem regressu ab autumnali ad Æquinoctium Vernalium. Notandum autem esse $C^2 - B^2 = 2 C^2 - 1 = \text{Cof. } 2 \times 23^\circ. 28' \frac{1}{2}$, et $B \times C = \frac{1}{2} \text{ Sin. } 2 \times 23^\circ. 28' \frac{1}{2}$, ideòque $\frac{C^2 - B^2}{B \times C} = 2 \times \frac{\text{Cof.}}{\text{Sin.}} 2 \times 23^\circ. 28' \frac{1}{2} =$

$\frac{2}{\text{Tang. } 2 \times 23^\circ. 28' \frac{1}{2}} \cdot \text{Quamobrem evadit } \frac{C^2 - B^2 \times p \times 90^\circ}{B \times C \times K \times EA}$

$= \frac{90^\circ \times 2 \times \text{Sin. } 5^\circ. 8' \frac{1}{2}}{K \times EA \times \text{Tang. } 2 \times 23^\circ. 28' \frac{1}{2}}$, atque hinc emergit Theorema sequens: *Est tangens duplicatæ inclinationis Æquatoris ad Eclipticam ad finem duplicatæ inclinationis orbis lunaris ad Eclipticam ut radius ad finem quemdam: tumque, est motus medius nodorum ad motum medium æquinoctiorum vi lunæ genitum ut sinus mox inventus ad finem æquationis Æquinoctiorum maximæ. Loco finis dupli inclinationis orbis*

orbis lunaris ad Elipticam in Theoremate usurpo propter analogiam finum duplicatæ ejusdem inclinationis, cum error inde exurgens sit contemnendus, ut quisque experiri facile potest. Est autem motus nodorum lunæ annuus $19^{\circ}.20'\frac{1}{2}$, et motus Æquinoctiorum annuus vi lunæ genitus $39'',717$ ex Coroll. I. prop. I, existente ratione diametrorum terræ æquali $\frac{230}{229}$, proindeque est $K=1753$. Idem Æquinoctiorum motus, existente $\frac{178}{177}$ ratione diametrorum terræ, est $36'',625$, atque adeò $K=1901$. Unde in priori casu prodit æquatio Æquinoctiorum maxima $19'.38''$; in posteriori $18''.16''$. *Q. E. I.*

COROLL.

Ex hac propositione Præcessio Æquinoctiorum vi lunæ genita pro tempore dato proportionalis est quantitati $b \times c \times k$ five $BC - \overline{C^2 - B^2} \times pu$: maxima ergo est ubi nodus lunæ ascendens versatur in principio Arietis, tunc enim est $u=-1$; minima autem, ubi idem nodus transit in signum libræ, ob $u=1$ eo in casu. Unde, quoniam præcessio annua vi lunæ genita est æqualis $\frac{39'',717}{B \times C} \times B \times C - \overline{C^2 - B^2} \times pu$, vel $\frac{36'',625}{B \times C} \times B \times C - \overline{C^2 - B^2} \times pu$, nullâ habitâ ratione mutationis sitûs nodorum per id temporis factæ, differentia inter præcessionem annuam mediocrem et maximam erit $\frac{39'',717 \times \overline{C^2 - B^2} \times p}{B \times C} = \frac{39'',717 \times 2 \times \text{Sin. } 5^{\circ}.8'\frac{1}{2}}{1 \text{ ang. } 2 \times 23^{\circ}.28'\frac{1}{2}}$, vel $\frac{36'',625 \times 2 \times \text{Sin. } 5^{\circ}.8'\frac{1}{2}}{\text{Tang. } 2 \times 23^{\circ}.28'\frac{1}{2}}$.

Igitur, *Est tangens duplicatæ inclinationis Elipticæ ad Æquatorem ad finum duplicatæ inclinationis Orbis lunaris*

lunaris ad Eclipticam ut præcessio annua Æquinoctiorum mediocris vi lunæ genita ad differentiam inter præcessionem mediocrem et maximam seu minimam. Unde in priori casu est hæc differentia æqualis $6''.37''$, in posteriori $6''.6''$, proindeque si tota præcessio annua statuatur $50''.20''$, eo anno, in cuius medio circiter nodus lunæ ascendens occupat primum gradum Arietis, præcessio æquinoctiorum erit $56''.57''$, vel $56''.26''$: ubi autem nodus subit signum Libræ, præcessio illius anni erit $43''.43''$, vel $44''.14''$. Et quia differentia prædicta in aliis temporibus est ut finis distantiae nodi a punctis Solstitialibus, facile habebitur pro anno quolibet, dato nodorum situ.

PROPOSITIO III. PROBLEMA.

Invenire Variationem Inclinationis Eclipticæ ad Æquatorem quam generat vis Solis.

Manentibus iis quæ in propositione primâ dicta sunt, producat arcus LS (Fig. 3.) ad V ut LV fit quadrans circuli, et dimittatur Vs perpendicularis in arcum pN productum, eritque Vs mensura Variationis horariæ inclinationis Eclipticæ ad Æquatorem. Est autem $Vs. Lr::TI. PI$, et $Lr. Ln::B. 1$, atque per propositionem primam præcessio æquinoctiorum horaria Ln est ad præcessionem horariam ubi sol versatur in Solstitiis quam voco U , ut \overline{RH}^2 ad \overline{TR}^2 ; quare conjunctis rationibus est $Vs. U:: \frac{B \times TI \times \overline{RH}^2}{PI} \cdot \overline{TR}^2$, five, ob $TR=1$, $PI=\frac{C \times RH}{PM}$. $TI=\frac{TH}{PM}$, est $Vs. U:: \frac{C}{B} \times RH \times TH. 1$; et summa variationem omnium horariarum Vs quo tempore sol

sol describit arcum LR est ad summam totidem
angulorum U ut summa omnium factorum $RH \times TH$
ducta in $\frac{B}{C}$ ad summam totidem quadratorum 1, id

est, ut $\frac{RH}{2} \times \frac{B}{C}$ ad arcum LR , et Variatio tota quæ

minuitur inclinatio \AA equatoris ad Eclipticam in pro-
gressu solis ab \AA equinoctio ad Solstitium est ad sum-
mam angulorum U (quæ tunc evadit æqualis semissii
præcessionis annuæ vi solis genitæ, hoc est, æqualis
 $\frac{10'',583}{2}$ vel $\frac{13'',675}{2}$) ut $\frac{B}{2C}$ ad arcum LV , ac pro-

inde Variatio tota fit $\frac{B \times 10'',583}{C \times 4 LV} = \frac{10'',583 \times \text{Tang. } 23^\circ 28'\frac{1}{2}}{4 LV}$,

vel $\frac{13'',675 \times \text{Tang. } 23^\circ 28'\frac{1}{2}}{4 LV}$, unde nascitur hoc Theo-

rema: *Motus solis est ad motum æquinoctiorum vi so-
lis genitum ut tangens Inclinationis mediocris Eclipti-
cæ ad Æquatorem ad tangentem Variationis totius
ejusdem Inclinationis.* Atque hinc Variatio tota eli-
citur in priori casu æqualis $44'$, in posteriori $57'$,
sole scilicet in Solstitiis existente: in aliis locis va-
riatio est, ut patet, in duplicatâ ratione finûs distantiae
solis ab \AA equinoctio ad radium, ac propterea diffe-
rentia inter semissiem variationis totius et variationem
genitam quo tempore sol describit arcum quemlibet
 LR est ad semissiem variationis totius, seu ad $22''$

vel $28''\frac{1}{2}$, ut $2 \overline{RH} - 1$ ad 1, hoc est, ut cosinus
duplæ distantiae solis ab \AA equinoctio ad radium;
adeoque, dato solis loco, datur hæc differentia sive
æquatio, quæ addenda est Inclinationi mediæ Eclipti-
cæ, ubi distantia solis ab \AA equinoctio alterutro minor
est 45 gradibus; et ubi major est hæc distantia, sub-

ducitur. Maxima igitur est Inclinationis Eclipticæ ad Æquatorem, sole versante in Æquinoctiis; minima, sole occupante Solstitia. *Q. E. I.*

PROPOSITIO IV. PROBLEMA.

Variationem Inclinationis Eclipticæ, quæ pendet à vario situ Nodorum lunæ, determinare.

Iisdem positis quæ in propositione secundâ tradita sunt, jam sit luna in *K* (Fig. 5.) et describatur arcus circuli maximi *KZ* perpendicularis in Æquatorem *DZS*, et per punctum *Z* arcus *Zd* exhibens situm æquatoris post horæ spatium: secet autem *Zd* orbem lunæ in *d*, et lineas *Dg*, *Lr*, in *e* et *q*; atque ex puncto *V* æquatoris, existente *LV* quadrante circuli, demittatur in arcum *dZ* productum perpendicularis *Vt*. Designet *P* motum mediocrem horarium æquinoctiorum vi lunæ genitum, atque per propositionem secundam est *P. Dd::C.c*; et existente *DS* quadrante circuli, ex demonstratis in propositione primâ sequitur esse $2 Dd: Dd::1: \text{Sin. } \overline{DK}^2$; habetur autem *Dd: De::1:b*; tum *De: Lq::Sin. DZ: Sin. LZ*, et *Lq. Vt::Sin. LZ: Cos. LZ*; unde per compositionem harum omnium rationum fit $2 P: Vt::C \times \text{Sin. } DZ: b \times c \times \overline{\text{Sin. } DK}^2 \times \text{Cos. } LZ$. Est autem $\text{Cos. } LZ = \text{Sin. } DL \times \text{Sin. } DZ + \text{Cos. } DL \times \text{Cos. } DZ$, hincque $2 P. Vt:: C: b \times c \times \overline{\text{Sin. } DK}^2 \times \text{Sin. } DL + \text{Cos. } DL \times \frac{\text{Cos. } DZ}{\text{Sin. } DZ}$; sed in triangulo sphaerico *DKZ* habetur $c: 1:: \text{Cotang. } DK \text{ five } \frac{\text{Cos. } DK}{\text{Sin. } DK}: \text{Cotang. } DZ \text{ five } \frac{\text{Cos. } DZ}{\text{Sin. } DZ}$; unde tandem prodit $2 P$ ad *Vt* ut *C* ad $b \times c \times \text{Sin. } DL \times \overline{\text{Sin. } DK}^2 + bc \text{ Cos. } DL \times \text{Sin. } DK \times \text{Cos. } DK$. Summa igitur omnium *Vt*, hoc est, summa variationum

tionum omnium horariarum Inclinationis Eclipticæ tempore revolutionis lunæ genita, manente situ nodorum, est ad summam totidem motuum P ut summa omnium quantitatum $2b \times c \times \text{Sin. } DL \times \overline{\text{Sin. } DK} + 2b \times \text{Cof. } DL \times \text{Sin. } DK \times \text{Cof. } DK$ in circulo ad summam totidem cosinum C , id est, ut $b \times c \times \text{Sin. } DL$ ad C . Posito itaque, ut prius, motu medio nodorum ad motum medium æquinoctiorum vi lunæ genitum ut K ad 1 , erit variatio mediocris horaria inclinationis Eclipticæ in mense dato ad motum horarium, mediocrem nodorum Ff , ut $b \times c \times \text{Sin. } DL$ ad $C \times K$, id est, ob $\text{Sin. } DL = \frac{pv}{b}$ et $c = Cq + Bpu$, ut $Cpqv + Bp^2vu$ ad $C \times K$ five ut pv ad K quam proximè, adeoque summa omnium variationum inclinationis Eclipticæ quo tempore nodus lunæ describit arcum EF est ad motum nodi EF ut summa omnium pv ad summam totidem K , hoc est, ut $p \times 1 + u$ ad $K \times EF$, et variatio tota quâ mutatur inclinatio Eclipticæ in regressu nodi ab uno Æquinoctio ad alterum, est ad motum nodorum 180° ut $2p$ ad $K \times EL$, quæ proinde æquatur $\frac{2p \times 180^\circ}{K \times EL}$, atque adeò per Theorema sequens facilè prodibit: *Motus Nodorum est ad motum Æquinoctiorum vi lunæ genitum ut sinus inclinationis Orbitæ lunaris Eclipticæ ad sinum semissis Variationis totius Inclinationis Eclipticæ ad Æquatorem.*

Si ratio diametrorum terræ fit $\frac{732}{229}$, est motus nodorum lunæ ad motum æquinoctiorum ex prop. ut 1753 ad 1 , et ut 1901 ad 1 si ratio terræ diametrorum fit $\frac{178}{177}$. In priori casu per Theorema prodit

Variatio

Variatio tota Inclinationis Eclipticæ $21^{\circ}.5''$; in casu posteriori $19^{\circ}.27''$: generatur autem tempore quo transeunt Nodi Lunares ab uno Æquinoctio ad alterum. In locis inter Æquinoctia variatio erit ad variationem totam, ex mox demonstratis, ut $1 + u$ ad 2, hoc est, ut sinus versus distantiae nodi ab Æquinoctio Verno ad diametrum; vel, differentia inter semissem variationis totius et variationem pro tempore dato est ad semissem variationis totius, nempe ad $10^{\circ}.32''\frac{1}{2}$ vel $9^{\circ}.43''\frac{1}{2}$, ut cosinus distantiae nodi ab Æquinoctio Verno ad radium: additur autem hæc differentia sive æquatio Inclinationi mediæ Eclipticæ in regressu nodi à Solstitio Æstivali ad Solstitium Hybernale, ac in alterâ medietate revolutionis nodi subducitur, ut habeatur Inclinatione Eclipticæ vera. Et maxima est Eclipticæ Obliquitas ubi nodus lunæ ascendens Æquinoctium ævernum sive ingressum Arietis tenuerit; minima vero, cum idem nodus ad Autumnale Æquinoctium sive ad signum Libræ retrorsum pervenerit. *Q. E. I.*

PROPOSITIO V. PROBLEMA.

Inæqualitates Præcessionis Æquinoctiorum et Variationis Obliquitatis Eclipticæ, quæ pendere possunt ex situ Apogæi Lunæ, investigare.

Describat luna in plano Eclipticæ ellipsim *APBL* (Fig. 6.) cujus centrum sit *C*, *T* focus quem Terra occupat, *AB* axis major, *CD* semiaxis minor, *TL* communis sectio planorum Æquatoris et Eclipticæ. Esto Luna in *P*, et ducantur *TP*, *Tp* quæ abscindant sectorem *TPp* motu lunæ horario descriptum. Centro *T* et radio semiaxi majori *CA* æquali describatur circulus *HNO* secans *TP* et *Tp* in *N* et *n*, atque in *TL* demittantur perpendiculara *NI*, *nm*, et in

in TA perpendiculum NR . Si luna in circulo HNO revolvi supponeretur, ubi ad locum N per-
tingerit, præcessio horaria æquinoctiorum vi lunæ
genita foret, per demonstrata in propositione primâ,
ut \overline{NI} ; at præcessio illa crescit in ratione vis quâ
gignitur, et hæc vis est in ratione triplicatâ inversâ
distantiæ lunæ TP , adeoque præcessio horaria est ut
 $\frac{\overline{NI}^2}{\overline{TP}^3}$ five ut eadem quantitas $\frac{\overline{NI}^2}{\overline{TP}^3}$ ducta in sectorem

constantem TPp , hoc est, ut $\frac{\overline{NI}^2 \times Nn}{\overline{TP}}$ five ut $\frac{NI \times Im}{\overline{TP}}$;

sed ex naturâ ellipseos habetur $\frac{1}{\overline{TP}} = \frac{\overline{CA}^2 + TC \times TR}{CA \times \overline{CD}^2}$:

unde tota præcessio genitâ quo tempore luna in orbe
suo revolvitur est ut summa quantitatum $NI \times Im \times$
 $\frac{\overline{CA}^2 + TC \times TR}{CA \times \overline{CD}^2}$ in circulo, five (quia rejici potest ter-

minus ambiguus $\div \frac{TC \times TR}{CA \times \overline{CD}^2}$, utpote per alteram di-

midiam circumferentia circuli partem positivus, per
alteram dimidiam negativus) ut summa omnium in
circulo factorum $NI \times Im$, hoc est, ut area ipsa cir-
culi $HNOH$; ac proinde Præcessio Æquinoctiorum
in singulis lunæ revolutionibus manet eadem in quo-
libet Apogæi situ.

Variatio horaria inclinationis Eclipticæ, si luna
existeret in N revolvendo in circulo HNO , foret ex
demonstratis in prop. 3. ut $NI \times TI$: si verò trans-
feratur luna in P , eadem variatio erit ut $\frac{NI \times TI}{\overline{TP}^2}$ vel

ut $\frac{NI \times TI}{TP^3} \times TPp$, hoc est, ut $\frac{NI \times TI \times Nn}{TP}$ five,

ductâ nq parallelâ TI , ut $\frac{NI \times nq}{TP}$; proindeque, ob rationem mox datam, variatio Inclinationis Eclipticæ tempore revolutionis lunæ genita est ut summa omnium in circulo factorum $NI \times nq$, id est, nulla.

Hinc licité colligi videtur nullam ex situ Apogæi Lunæ five in motu Æquinoctiorum five in Obliquitate Eclipticæ induci variationem. *Q. E. I.*

SCHOLIUM I.

Ex præcedentibus liquet Terræ Polis geminos motus competere ab utrisque seorsim Solis et Lunæ, quatenus extra Æquatorem revolventium, viribus oriundos; alterum plano Eclipticæ parallelum, quo puncta Æquinoctialia in antecedentia continuò retrahuntur, ac propterea stellæ promoveri videntur in consequentia. Motus alter est ad planum Eclipticæ perpendicularis, quo Terræ Poli nutant et oscillantur accedendo ad polos Eclipticæ et ab eis recedendo per vices, atque inde mutatur Declinatio stellarum. Horum motuum quantitatem directè deduximus ab excessu altitudinis terræ ad Æquatorem supra altitudinem ejus ad polos, secundum duplicem hypothefim, quâ nempe excessus ille æstimatur pars $\frac{1}{230}$ vel $\frac{1}{178}$ altitudinis totius, quæ hætenus est à Mathematicis potissimum usurpata. Si verò nota præsupponatur Nutatio terræ axis, quæ quatenus actioni lunæ debita statuatur æqualis $18''$, et inde quærantur motus reliqui, per propositiones supra traditas ii prodeunt, præcessio scilicet æquinoctiorum annua medio-

cris

cris vi solis genita $16''.24'''$, vi lunæ $33''.54'''$, æquatio præcessionis maxima vi solis $1''.23'''$, vi lunæ $16'.45'''$: Nutatio axis vi solis $1''.10'''$, manente nimirum terrâ uniformiter densâ.

Ut autem innotesceret quænam ex tribus recentis hypothefibus cum Phænomenis Cœlestibus maxime conveniret, tabulas pro singulis confeceram et inde supputaveram variationes declinationis stellarum illarum sex, quas exhibet *Bradleius* in *Epistolâ* suâ de Nutatione axis terræ in *Trans. Phil.* unde compertum et errores variationum computatarum intra arctiores limites contineri in hypothefi illâ, quâ Nutatio statuitur $19'.27''$ existente $\frac{178}{177}$ ratione terræ diametrorum. Quapropter tabulas hujus hypothefis proprias visum est hîc tradere, per Coroll. 2. prop. 1. et prop. 2. 3. et 4. ad partem primam decimalem minuti secundi constructas.

Æquatio Æquinoctiorum Solaris.				
☉	Sig. O	I	II	Subt.
ab γ	Sig. VI.	VII	VII	Subt.
0	//	//	//	
0	0.0	0.9	0.9	30
5	0.2	1.0	0.8	25
10	0.4	1.1	0.7	20
15	0.5	1.1	0.5	15
20	0.7	1.1	0.4	10
25	0.8	1.0	0.2	5
30	0.9	0.9	0.0	0
adde	Sig. V	IV	III	☉
adde	Sig. XI.	X	IX	ab γ

Æquatio Æquinoctiorum Lunar.				
☾	Sig. O	I	II	Subt.
ab γ	Sig. VI.	VII	VIII	adde
0	//	//	//	
0	0.0	9.1	15.7	30
5	1.6	10.4	16.4	25
10	3.1	11.6	17.0	20
15	4.7	12.8	17.5	15
20	6.2	13.9	17.8	10
25	7.7	14.8	18.0	5
30	9.1	15.7	18.1	0
Subt.	Sig. V	IV	III	☾
adde	Sig. XI	X	IX	ab γ

Æquatio Obliq. Æclipticæ Solaris.					Æquat. Obliq. Æclipticæ Lunar.				
☉	Sig. ☉ ad.	I ad.	II sub.		☾	Sig. ☉	I	II	adde
ab γ	Sig. VI ad.	VII. ad	VIII sub.		ab γ	Sig. VI	VII	VIII	Subt.
0	//	//	//		0	//	//	//	
5	0.5	0.3	0.3	30	5	9.7	8.4	4.9	30
10	0.5	0.2	0.3	25	10	9.7	8.0	4.1	25
15	0.4	0.1	0.4	20	15	9.6	7.4	3.3	20
20	0.4	0.0	0.4	15	20	9.4	6.9	2.5	15
25	0.4	Subt.	0.4	10	25	9.1	6.2	1.7	10
30	0.3	0.1	0.5	5	30	8.8	5.6	0.8	5
	0.3	0.3	0.5	0		8.4	4.9	0.0	0
	Sig. V. ad	IV sub.	III sub.	☉	Subt.	Sig. V	IV.	III	☾
	Sig. XI. ad	X sub.	IX sub.	ab γ	adde	Sig. XI	X	IX	ab γ

Jam ut pateat qualis sit Theoriæ cum Phænomenis consensus, subjiciemus computationes variationum stellarum sex prædictarum ex tabulis præcedentibus derivatas. Quam obtinent formam hujusmodi tabulæ apud *Bradleium*, eandem hic retinent, et quidem columnæ, prima secunda et quarta eadem sunt; Prima nempe indicat tempora Observationum; Secunda distantias stellarum à puncto in Sectore determinato mensuratas, Quarta Aberrationem lucis; Tertia autem hîc exhibet variationem declinationis cujusque stellæ ortam ex præcessione æquinoctiorum secundum priores duas tabulas suprà traditas æquatâ; Quinta exhibet variationem declinationis ortam ex Nutatione terræ axis five ex Æquatione Obliquitatis Æclipticæ e duabus tabulis posterioribus excerptâ et adhibitâ secundum stellæ ascensionem rectam; Sexta tandem exhibet distantiam stellæ mediam ad diem 27^{um} Martii an. 1727 à puncto sectoris in columnâ secundâ notato: hæc autem distantia colligitur ex numeris in columnis 2^a, 3^a, 4^a et 5^a scriptis et secundum.

cundum sua signa ritè conjunctis : unde, si tum Observationes, tum æquationes motuum, essent omnes ad amissim accuratæ, omnes cujusque stellæ distantia in hac columnâ expressæ forent ubique æquales.

γ Draconis.	Dist. Aut. a' 38°. 25	Var. Decl. ex Præcef.	Aberratio Lucis	Var. Decl. ex Nutat.	Distantia media
	"	"	"	"	"
1727 Septemb. 3	70.5	-0.4	+19.2	-10.1	79.2
1728 Martii - 18	108.7	0.9	-19.0	8.5	79.3
Septemb. 6	70.2	1.4	+19.3	9.1	79.0
1729 Martii - 6	108.3	1.8	-19.3	9.2	79.0
Septemb. 8	69.4	2.3	+19.3	7.1	79.3
1730 Septemb. 8	68.0	3.2	19.3	4.3	79.8
1731 Septemb. 8	66.0	4.1	19.3	-1.1	80.1
1732 Septemb. 6	64.3	4.9	19.3	+2.0	80.7
1733 Augusti 29	60.8	5.7	19.0	5.1	79.2
1734 Augusti 11	62.3	6.4	16.9	7.5	80.3
1735 Septemb. 10	60.0	7.2	19.3	8.8	80.9
1736 Septemb. 9	59.3	7.9	19.3	9.2	79.9
1737 Septemb. 6	60.8	8.7	19.3	8.5	79.9
1738 Septemb. 13	62.0	9.4	19.3	6.7	78.6
1739 Septemb. 2	66.5	10.2	19.2	4.4	80.0
1740 Septemb. 5	70.8	11.0	19.6	+1.2	80.3
1741 Septemb. 2	75.4	11.8	19.2	-2.0	80.8
1742 Septemb. 5	70.7	12.6	19.3	5.2	78.2
1743 Septemb. 2	81.6	13.5	19.1	7.6	79.6
1745 Septemb. 3	86.3	15.3	19.2	10.1	80.1
1746 Septemb. 17	85.5	16.4	19.2	9.8	79.5
1747 Septemb. 2	86.1	17.2	19.2	8.4	79.7

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35* Cameopardari Hevelii	Dist. Auf. a' 38° 25'	Var. Decl. ex Præces.	Aberratio Lucis	Var. Decl. ex Nutat.	Distantia media
1727 Octob. - 20	" 73.6	+0.9	-6.7	+9.7	77.5
1728 Januar. - 12	60.8	1.3	+6.1	9.2	77.4
Martii - 1	57.8	1.6	+9.4	9.6	78.4
Septemb. 26	75.2	2.5	-8.8	8.9	77.8
1729 Februar. 26	56.4	3.2	+9.4	8.2	77.2
1730 Martii - 3	57.8	4.8	9.4	5.8	77.8
1731 Februar. - 5	59.1	6.1	8.5	+2.8	76.5
1733 Januar. - 31	64.1	9.2	8.2	-3.6	77.9
1733 Decemb. 30	61.8	16.8	4.3	6.9	76.0
1739 Februar. 4	56.9	16.9	8.5	6.0	76.3
1740 Januar. - 20	56.0	18.1	7.0	-3.6	77.5
1747 Februar. 27	32.3	28.7	9.4	+9.2	79.6

α Cassiope	Dist. Auf. a' 34° 55'	Var. Decl. ex Præces.	Aberratio Lucis	Var. Decl. ex Nutat.	Distantia media
1727 Septemb. 9	" 55.0	+10.2	+2.2	+1.1	68.5
1728 Septemb. 17	30.8	32.8	+4.6	1.0	69.2
1729 Junii - - 8	A 35.7	48.7	-16.3	0.7	68.8
Decemb. 3	B 9.4	59.1	+16.5	0.6	66.8
1730 Junii - 11	A 13.8	70.3	-15.2	0.4	68.3
Decemb. 9	B 30.8	80.7	+16.3	+0.3	66.5
1732 Januar. - 8	49.2	102.9	12.9	-0.1	66.5
1733 Januar. 21	64.8	123.1	+10.0	0.4	67.9
1734 Junii - - 13	62.8	148.5	-16.1	0.9	68.7
Decemb. 11	105.4	157.4	+16.2	1.0	67.2
1738 Decemb. 23	176.3	229.3	+15.2	0.8	67.1
1740 Junii - - 2	169.1	255.1	-16.5	-0.3	69.9
1747 Februar. 27	332.3	400.3	+00.2	+1.0	69.1

τ Persei	Dist. Auf. a' 31' 20'	Var. Decl. ex Præces.	Aberratio Lucis	Var. Decl. ex Nutat.	Distantia media
1727 Septemb. 16	" 60.1	+8.2	-3.2	+6.3	71.4
Decemb. 29	39.7	13.5	+12.9	5.6	71.7
1728 Decemb. 21	22.5	30.4	12.8	4.8	70.5
1729 Decemb. 2	A 9.2	46.3	11.5	3.5	70.5
1731 Januar. - 3	B 8.2	64.6	12.8	+1.6	70.8
1732 Januar. - 8	22.0	80.7	12.7	-0.4	71.0
1733 Januar. 21	34.6	96.5	11.7	2.4	71.2
1738 Decemb. 23	117.0	179.4	12.8	4.4	70.8
1740 Januar. - 22	132.5	195.3	11.7	2.3	72.2

α Persei

α Persei	Dist. Ang. a 41° 5'	Var. Decl. ex Præcef.	Aberratio Lucis	Var. Decl. ex Nutat.	Diffantia media
	//	//	//	//	//
1727 Decemb. 29	79.4	+12.0	+11.4	+6.5	109.3
1728 Aprilis - 7	87.5	15.7	-00.8	6.8	109.2
Julii - - 5	94.6	20.0	-11.4	6.1	109.3
Decemb. 13	65.7	26.5	+10.6	5.6	108.4
1729 Decemb. 3	53.4	41.1	9.7	4.1	108.3
1731 Januar. - 3	38.6	57.2	11.4	+1.8	109.0
1732 Januar. - 8	26.8	71.4	+11.4	-0.5	109.1
1734 Julii - 11	A 21.3	104.4	-11.4	5.7	108.6
1738 Decemb. 24	B 56.3	159.1	+11.2	5.1	108.9
1740 Januar. - 21	71.8	173.1	10.9	-2.6	109.6
1747 Februar. 27	182.5	277.6	6.6	+6.7	108.4

η Ursæ Majoris	Dist. Ang. a 39° 15'	Var. Decl. ex Præcef.	Aberratio Lucis	Var. Decl. ex Nutat.	Diffantia media
	//	//	//	//	//
1727 Octob. 13	153.3	-11.1	+1.0	-4.0	139.2
1728 Januar. - 24	176.4	17.4	-17.6	3.8	137.6
Julii - 17	150.8	27.1	+17.8	3.5	138.0
Octob. - 11	170.6	31.2	+2.6	3.6	138.4
1729 Januar. - 16	196.6	37.2	-17.8	3.2	138.4
Julii - 21	170.4	47.4	+17.8	2.8	138.0
1730 Julii - 19	189.6	66.9	+17.8	1.7	138.8
Decemb. 28	232.4	75.3	-16.7	1.0	139.4
1731 Septemb. 18	218.1	88.4	+9.4	-0.4	138.7
1732 Januar. - 10	250.7	94.5	-17.7	+0.3	138.8
Aprilis 13	238.7	98.5	-00.8	0.4	139.8
1734 Julii - 11	255.7	137.8	+17.6	3.2	138.7
1735 Septemb. 10	280.8	156.5	+11.4	3.6	139.2
1736 Septemb. 8	294.7	172.6	11.6	3.8	137.5
1737 Julii - 3	303.0	186.0	17.2	3.9	138.0
1738 Junii - 29	319.0	202.0	16.8	3.3	137.0
1739 Aprilis 25	348.0	215.2	2.5	2.4	137.6
1740 Junii - 3	360.3	234.7	12.8	+1.2	139.6
1741 Septemb. 23	390.9	258.4	7.9	-0.8	139.6
1745 Septemb. 5	466.7	336.8	12.4	4.2	138.1
1746 Septemb. 20	492.0	358.8	8.8	4.1	138.7
1747 Septemb. 2	507.2	377.0	13.2	3.5	139.5

In huiusmodi igitur factâ collatione ea sanè elucet consonantia, quâ maiorem sperari vix posse nemo non fatebitur ; quod utique manifeste arguit ab Ill. *Bradleio* et summâ cum solertiâ observationes fuisse institutas et mirâ perspicaciâ veram motuum observatorum detectam causam.

Sed et ne sciri fortè desideraretur quantâ intercedat in duabus aliis hypothesebus Observationes inter et Theoriam discrepantia, non abs re esse putavimus medias stellarum earumdem distantias, quales ex Nutatione æquali 18" et 21".1 proveniunt, in sequentem tabulam congerere columnis sextis tabularum præcedentium respondentem.

Stellarum distantie mediae in hypothesi Nutationis 18''						Stellarum distantie mediae in hypothesi Nutationis 21'' .1					
γ Direc.	35^{a} , Camel.	α Cithop.	π Persei	α Persei	η Ursa M.	γ Direc.	35^{a} , Camel.	α Cithop.	π Persei	α Persei	η Ursa M.
"	"	"	"	"	"	"	"	"	"	"	"
79.8	76.8	68.3	71.0	108.6	139.7	78.5	78.3	68.5	72.0	110.0	138.7
79.8	76.7	68.8	71.1	108.6	137.8	78.6	78.3	69.3	72.4	110.0	137.3
79.5	77.9	68.4	69.8	108.7	138.4	78.4	79.1	69.0	71.2	110.1	137.5
79.4	77.3	66.3	69.9	107.7	139.1	78.4	78.4	67.0	71.3	109.2	137.9
79.7	76.7	67.8	70.3	107.6	138.9	78.9	77.7	68.5	71.4	109.0	137.8
80.0	77.5	65.8	70.6	108.6	138.5	79.6	78.1	66.6	71.4	109.5	137.5
80.0	76.3	66.1	71.1	108.8	139.3	80.1	76.6	66.7	71.4	109.4	138.2
80.5	78.1	67.5	71.4	108.7	139.9	81.0	77.5	68.0	70.2	108.4	138.8
78.9	76.3	68.5	72.9	109.6	139.2	79.7	75.5	68.8	71.5	108.3	138.2
79.7	76.7	67.0		110.2	139.6	81.0	75.6	67.3		109.0	138.3
80.2	77.7	67.7		107.9	140.4	81.8	77.2	67.0		109.1	139.3
79.0	79.1	70.3			138.5	80.8	80.3	69.7			138.6
79.2		68.8			139.1	80.8		69.3			139.5
78.0					137.0	79.4					137.8
79.6					140.2	80.5					138.6
80.1					135.4	80.5					137.7
80.8					137.1	80.8					138.2
78.3					138.9	77.9					140.1
80.0					139.2	79.0					140.1
80.9					138.4	79.4					137.8
80.0					139.2	79.8					138.2
80.3					140.1	79.2					139.0

Unde et id deprehenditur, loca stellarum in hac duplici hypothefi determinata etiam a veris non ita multum abluere.

Supereft ut habeatur Præceffio Æquinoctiorum annua pro quolibet nodorum lunæ fitu, quæ per Coroll. prop. 2. computata, existente nutatione $19''$. $27'$, exhibetur in tabula fequente.

Annua Præceffio Æquinoctiorum							
$\begin{smallmatrix} \odot \\ \text{ab } \Upsilon \end{smallmatrix}$	Sig. O	I	II	III	IV	V	
0	56.4	55.6	53.4	50.3	47.2	45.0	30
5	56.4	55.3	52.9	49.8	46.8	44.8	25
10	56.3	55.0	52.4	49.2	46.4	44.6	20
15	56.2	54.6	51.9	48.7	46.0	44.4	15
20	56.0	54.2	51.4	48.2	45.6	44.3	10
25	55.8	53.8	50.8	47.7	45.3	44.2	5
30	55.6	53.4	50.3	47.2	45.0	44.2	0
	Sig. XI	X	IX	VIII	VII	VI	$\begin{smallmatrix} \odot \\ \text{ab } \Upsilon \end{smallmatrix}$

SCHOLIUM II.

Si nulla habeatur ratio æquationum, quas in Præceffione Æquinoctiorum et Nutatione axis terræ generat vis folis, confequitur ex prop. 2. et 4. motum Poli terreftreis fatis accurate fieri in ellipfi, cujus axis major, qui jacet in plano Coluri Solstitiorum, eft æqualis $19''\frac{1}{2}$ et axis minor $14''\frac{1}{2}$, atque angulum defcribere circa centrum ellipfeos æqualem motui nodi lunaris.

Fortè arguet quis hypothefim, quam de denfitate terræ uniformi, fimulque de ejufdem diametrorum ratione $\frac{178}{177}$ liberè ufurpavimus, cum utrumque unà confiftere non poffit. Equidem, fi ad rerum cognitionem

tionem summam attingere fas esset, Theoriam inde perfectam evadere non diffitemur. Sed, præterquam quòd quænam sit accurata diametrorum ratio et constitutio interna globi terraquei hætenus non constat, atque etiam tædio nimis esset omnes, qui possunt casus diversæ densitatis excogitari, figillatim discutere; non sequitur labefactari præcedentem theoriam, etiam si fortè verum sit terram non esse uniformiter densam, neque proportionem diametrorum esse eam, quam adhibuimus. Nam, dato *Æquinoctiorum* motu medio à vi solis vel lunæ oruindo, patet ex propositionibus præcedentibus ritè inde determinari æquationes Præcessionis et Nutationis, quippe quæ in quacumque densitatis hypothesi semper sunt proportionales prædicto motui medio, et legem constantem servant. Unde, si vel *Æquinoctiorum* Præcessionem vel axis terræ Nutationem ipsam, quæ reverà est, assumpsimus, quantumvis simus de terræ configuratione hallucinati, vera omnia et firma consistere videtur.

SCHOLIUM III.

Quamquam Poli Terrestris evagationes, quâ potuimus perspicuitate, ex suis causis deduximus ac demonstravimus; theoriam tamen ipsam constructione geometricâ breviter illustrare non pigebit, cum unica ad eas, quæ a sole pendent, altera ad illas, quæ à lunâ, exhibendas constructio sufficiat.

* In circulo *LRG* (Fig. 7.) cujus centrum *T*, ducantur radii duo *TL*, *TR*, ad se invicem normales, et in *TR* sumpto puncto *V*, ità ut sit *TV* ad *RV* ut motus solis medius ad motum medium æquinoctiorum vi solis genitum, centro *T* et semiaxibus *TL*, *TV* de-

cribatur ellipsis LVG ; atque hoc pacto erit motus solis medius ad motum solis medium ab æquinoctio ut area ellipseos ad aream circuli, TR ad RV ut tangens obliquitatis Eclipticæ mediocris ad tangentem variationis totius ejusdem Obliquitatis. Et si exhibeat T terram, L punctum æquinoctiale, et in circulo ducatur radius quilibet TS ellipsim secans in P , erit motus æquinoctiorum ad motum solis medium, quo tempore sol ab æquinoctio degreditur per arcum LS , ut spatium SLP ad sectorem ellipticum PTL , et RV ad SP ut tangens variationis totius obliquitatis eclipticæ ad tangentem variationis tempore prædicto factæ, five ut ipsa variatio prior ad variationem posteriorem quam proximè. Item ductâ ad circumulum rectâ PF parallelâ rectæ TR , cum sit angulus STL distantia solis vera ab æquinoctio, erit angulus FTL distantia ejusdem media, atque adeò erit angulus FTS æquatio motûs æquinoctiorum, et finis hujus anguli, ubi maximus est in octantibus æquinoctiorum, est ad radium ut RV ad $TR + TV$, ex naturâ ellipseos; in aliis locis ejusdem æquationis finis, vel etiam ipsa æquatio, est ut finis duplæ distantie solis ab æquinoctio vel solstitio quam proximè. Ut hæc demonstrantur, motus solis ponatur uniformis, et recta TS ferri intelligatur circa centrum T cum summâ velocitatum solis et æquinoctii, atque in datâ temporis particulâ describat sectorem STs : hoc pacto si recta Ts fecet ellipsim in p , et ducatur SH perpendicularis in TL , ex naturâ hujus ellipseos datur sector PTp , et areola $SPps$ est ut \overline{SH}^2 , id est, ut quadratum finis distantie solis ab æquinoctio, atque in eâdem ratione est etiam linea SP quam proximè. Conferantur hæc cum demon-

stratis

stratis in prop. 3. et in Coroll. 2. prop. 1, et patebit constructio. Hic autem motum æquinoctiorum vi lunæ debitum negligo, quia parvi momenti est; sin ejus habeatur ratio, pro motu medio solis substitui debet summa motus medii solis et motus medii æquinoctii vi lunæ geniti.

Jam inæqualitates eæ, quæ pendent à situ nodorum lunæ, ita ferè exhiberi possunt. Circuli *EAG* (Fig. 8.) radius *TE* dividatur in *C*, ita ut sit *TE* ad *TC* ut motus nodi ab æquinoctio ad motum æquinoctii vi lunæ genitum, et ut radius ad sinum inclinationis orbis lunaris ad Eclipticam conjunctim, atque centro *C*, foco *T*, et semiaxe majore *CB=TE* describatur ellipsis *BAD*. Tum si area tota circuli *EAGE* exponat revolutionem nodi ad idem æquinoctium, area *BAE* sive *ADG* diminuta in ratione radii ad tangentem duplicatæ inclinationis Eclipticæ ad Æquatorem exprimet æquationem nodorum maximam quamproximè, et recta *BE* æqualis erit sinui æquationis maximæ Obliquitatis Eclipticæ ad radium *TE*. Insuper si *T* denotet terram, *E* punctum æquinoctii verni, et ad locum nodi ducatur recta *TP* occurrens circulo in *N* et ellipsi in *P*, æquatio æquinoctiorum eo tempore ad erit æquationem maximam ut spatium *BPNE* ad spatium *BAE*, et æquatio Obliquitatis Eclipticæ ad æquationem maximam ut recta *PN* ad rectam *BE*. Ubi nodus ultra Solstitium digressus pervenerit in *n*, ducto radio *Tn* secante ellipsim in *p*, æquatio æquinoctiorum eo in casu proportionalis est differentiæ spatiorum *ABE*, *Anp*, atque æquatio Obliquitatis Eclipticæ proportionalis linea *np* fit negativa. Cum enim perexigua sit excentricitas *TC*, ex naturâ ellipseos spatium *ABE* sive *ADG*, producto scilicet axe majore *BD*

donec fecet circulum in G , æquatur factò $TE \times TC$ quam proximè, et ductâ NH perpendiculari in TE , est spatium $BPNE$ ut NH et recta PN ut TH . His igitur collatis cum iis quæ demonstrata sunt in prop. 2 et 4, palam fiet constructio.

Hîc monitum volo, quod initio fieri oportuit, per motum solis vel nodi medium, de quo toties est sermo in propositionibus, intelligi debere motum solis vel nodi medium ab æquinoctio, id est, motum compositum ex motuum mediocrium vel summâ solis et æquinoctii, vel differentiâ nodi et æquinoctii. Quamvis enim motus ille æquinoctii tantillus sit præ motu solis vel nodi, ut in computo æquationum præcessionis æquinoctiorum vel nutationis axis terræ nullum ejus omisio inducat errorem sensibilem, hoc eò cavetur, ut accurata procedat propositionum demonstratio.

Denique Orbitæ Lunaræ ad Eclipticam inclinationem constantem supponere non dubitavi, licet variabilis sit; siquidem, cum variatio illa sit paucorum minutorum, atque adeò æquationem nonnisi perexiguam hîc generare valeat, hujusmodi minutiis Theoriam implicare atque onerare nolui.

C. Walmesley.

De Inæqualitatibus motuum Terræ.

QUIBUS in motu suo Tellus nostra ob actionem Lunæ inæqualitatibus subjaceat, ab aliis jam ferè expensum habetur. Quæ verò perturbationes ex viribus planetarum reliquorum oriri possint, quia vix quidquam delibatum reperitur, ideò visum fuit harum investigationem juxta principia *Gravitatis Newtonianæ* instituere. Actiones quidem Mercurii, Veneris et Martis, ob horum corporum parvitatem et vires ignotas, prætermittimus; atque adeò ad solas Jovis et Saturni, præsertim Jovis planetarum omnium maximi, disquisitio nostra restringitur. Plana autem orbium horum planetarum, licèt ob mutuas actiones non penitus immota, in sequentibus tamen tanquam immota supponere fas erit, cum tantilla mutatio in motum terræ vix influere possit.

PROPOSITIO I. PROBLEMA.

Invenire vires Jovis et Saturni ad perturbandum motum Terræ.

Esto Sol in *S*, (Fig. 1.) Jupiter in *I*, Terra in *T* revolvens in orbe *TOT*; jungantur *SI*, *IT*, *ST*, quarum *ST* secet orbitam Lunæ *HLH* in *L*. Tum simile adhibendo ratiocinium, quo à *Newtono* determinatur actio solis in lunam, si *SI* exhibeat gravitatem solis in Jovem, *ST* exhibebit vim quâ Jupiter deprimit terram versùs solem quamproximè; gravitas autem solis in Jovem est ad gravitatem Jovis in solem paribus distantiiis, ex demonstratis apud *Newtonum*

tonum, ut 1 ad 1067, et gravitas Jovis in solem est ad gravitatem terræ in solem ut \overline{ST}^2 ad \overline{SI}^2 : tum est gravitas terræ in solem ad vim solis deprimentem lunam versus terram ut ST ad TL . Conjungantur hæ rationes, et prodibit vis Jovis deprimens terram in solem ad vim solis deprimentem lunam in terram ut \overline{ST}^4 ad $\overline{SI}^3 \times TL \times 1067$ quamproximè, sive, quia scribendo S et I pro temporibus periodicis terræ et jovis est \overline{ST}^3 . ad \overline{SI}^3 :: SS . II , ut $SS \times ST$ ad $II \times TL \times 1067$; atque in hac ratione est vis Jovis ad perturbandum motum terræ ad vim solis quâ perturbatur motus lunæ. Datur autem vis posterior, ergo et prior habebitur.

Quoniam est gravitas Saturni in solem ad gravitatem solis in Saturnum in æqualibus distantis ut 3021 ad 1, loco numeri 1067 in præcedenti computo substituatur 3021 et loco revolutionis Jovis ea Saturni, atque habebitur ratio vis Saturni in terram ad vim solis in lunam. *Q. E. I.*

COROLL.

Quoniam errores lineares ex viribus diversis oriundi sunt ut vires ipsæ et quadrata temporum conjunctim, et errores angulares ut ipsi lineares applicati ad orbium radios, sequitur errores angulares terræ annuos e sole spectatos esse, ad errores angulares lunæ lunæ menstruos e terrâ spectatos in ratione compositâ, in ratione directâ virium Jovis in terram et solis in lunam ac duplicatâ temporum periodicorum terræ circa solem et lunæ circa terram conjunctim, et ex ratione inversâ radiorum ST , TL , id est, si scribatur L pro tempore periodico lunæ, ex supra demon-

stratis,

fratis, ut S^4 ad $II \times LL \times 1067$ five ut 1 ad $\frac{II}{SS} \times \frac{LL}{SS} \times 1067$. Quamobrem hi errores in dato tempore, v. g, in certo annorum numero erunt ad se invicem ut 1 ad $\frac{II}{SS} \times \frac{L}{S} \times 1067$; hoc est, inæqualitates motûs terræ sunt ad inæqualitates motûs lunæ in tempore dato in ratione compositâ, ex ratione duplicatâ temporis periodici terræ ad tempus periodicum Jovis, ex ratione simplici temporis periodici terræ circa solem ad tempus periodicum lunæ circa terram, et ex ratione gravitatis in Jovem ad gravitatem in solem, conjunctim. Existentibus igitur temporibus periodicis, ovis Jdierum 4332,514; terræ 365,2565; lunæ 27,3215; erunt inæqualitates motûs terræ vi Jovis ad inæqualitates motûs lunæ in tempore dato in ratione 1 ad 11229,4.

Pro revolutione Jovis ponatur revolutio Saturni, dierum scilicet 10759,275; et pro 1067 adhibeatur numerus 3021, eruntque inæqualitates motûs terræ vi Saturni genitæ ad inæqualitates motûs lunæ in dato tempore ut 1 ad 196076,5. Et inde prodit vis saturni ad vim Jovis ad perturbandum motum terræ ut 1 ad 17,46.

PROPOSITIO II. PROBLEMA.

Determinare motus Nodorum et Apfidum Orbis Terrestris.

Per motum nodorum orbis terrestris intelligo motum lineæ interfectionis orbium terræ et Jovis vel Saturni factum in plano orbis Jovialis vel Saturnii. Motus nodorum lunæ in anno sidereo juxta Astronomos est $19^{\circ}. 20'. 32''$, et hic motus ductus in 100 et

dimi-

diminutus in ratione 1 ad 11229,4 per Coroll. prop. præced. fit $10'. 20'' . 5'''$, qui auctus in ratione cosinûs inclinationis orbis Jovialis ad Eclipticam ad cosinûs inclinationis orbis lunaris, id est, in ratione cosinûs anguli $1^\circ . 19' . 10''$ ad cosinûm anguli $5^\circ . 8\frac{1}{2}'$, evadit $10'. 22'' . 26'''$. Hic igitur est motus nodorum terræ regressivus in plano orbis Jovialis in annis centum fideriis ex vi Jovis. Tum minuatur motus iste $10'. 22'' . 26'''$ in ratione 1 ad 17,46, et prodibit motus nodorum, quem eodem tempore generat vis Saturni in plano sui orbis sive etiam in plano orbis, Jovialis proximè, æqualis $35'' . 39'''$. Motus igitur nodorum terræ totus ex viribus conjunctis in annis centum in plano orbis Jovialis est $10'. 58''$ circiter in antecedentia.

Eadem prorsus ratione colligi potest motus Aphelii terræ: erit enim et hic motus, quatenus ex vi Jovis oritur, ad motum Apogæi lunæ in dato tempore ut 1 ad 11229,4; adeoque si apogæum lunæ conficiat annuatim $40^\circ . 40' . 43''$ in consequentia, aphelium terræ conficiet annuatim $13'' . 3''' . 28^{iv}$ et in annis centum $21'. 44''$ etiam in consequentia. Deinde imminutus hic motus in ratione 1 ad 17,46 fiet $1'. 14''\frac{1}{2}$ quem generat vis Saturni; atque horum motuum summa sive totus aphelii terræ motus progressivus in annis centum evadit $22'. 58''\frac{1}{2}$, et motus annuus $13'' . 47'''$. Hoc autem congruit cum tabulis celebrioribus Astronomicis, quæ progressum Aphelii terræ annum vulgò exhibent plus minus $1'. 3''$, hoc est, ablato motu regressivo $50''$ æquinoctiorum, $13''$. *Q. E. I.*

COROLL. I.

Errores lineares planetarum Jove inferiorum erunt in singulis eorum revolutionibus proximè ut vires Jovis in eos exercitæ et quadrata temporum revolutionum conjunctim; et quia plana horum orbium à se invicem et à plano orbis Jovis parum divergunt, vis Jovis ad perturbandum singulorum motus est ut distantia cujusque planetæ à sole, unde eorum errores angulares erunt in singulis revolutionibus ut quadrata temporum periodicorum, ac proinde in tempore dato ut ipsa tempora periodica, five in ratione sesquiquiplicatâ distantiarum ipsorum à sole. Quare posito motu nodorum terræ in annis centum $10'. 22''\frac{1}{2}$ ex vi Jovis in antecedentia, et $35''\frac{1}{2}$ ex vi Saturni, uti supra definitum est; et existente periodo Martis dierum 686,9785; Veneris 224,701; et Mercurii 87,9692; confit tabella sequens.

Mot. Nodor. in annis 100	Ex vi Jovis	Ex vi Saturni	Mot. totus regressivus
Martis - -	$19'. 30''$	- $1'. 7''$	- - $20'. 37''$
Veneris -	$6. 23$	- $0. 22$	- - $6. 45$
Mercurii -	$2. 29\frac{1}{2}$	- $0. 8\frac{1}{2}$	- - $2. 38$

Pariter si aphelium terræ in annis centum vi Jovis conficiat $21'. 44''$ in consequentia, et vi Saturni $1'. 14''\frac{1}{2}$, habebuntur pro reliquis planetis

Mot. Aphel. in annis 100	Ex vi Jovis	Ex vi Saturni	Mot. totus progressivus
Martis -	$40'. 52''\frac{1}{2}$	- $2'. 20''\frac{1}{2}$	- $43'. 13''$
Veneris -	$13. 22$	- $0. 46$	- $14. 8$
Mercurii -	$5. 14$	- $0. 18$	- $5. 32$
Vol. 49.		5 B	Newtonus

Newtonus quidem in scholio ad prop. 14. lib. 3. *Phil. Nat.* hos Apheliorum motus minores statuit, sed ideò quod motum Aphelii Martis, ex quo cæteros derivat, assumpserit, ceu ex Observationibus, æqualem $33'.20''$ in annis centum: verum suspicor hunc Aphelii Martis motum per Observationes nondum accuratè compertum haberi. Quin et discrepantia tabularum Astronomicarum dubium injicit de velocitate Apheliorum et Nodorum Planetarum penè omnium non adhuc certò constare apud Astronomos. Sed hæc non sunt hujus instituti.

COROLL. II.

Designet IDd (Fig. 2.) orbitam Jovis, DE eclipticam quæ post centum annos situm habeat dE , translato nodo à D in d : ducto arcu Dg perpendiculari in dE , erit Dd ad Dg ut radius ad sinum inclinationis orbis Jovialis ad eclipticam, hoc est, ut radius ad sinum anguli $1^\circ.19'.10''$; adeoque existente $Dd = 10'.58''$, ut supra definitum est, erit $Dg = 15''.9'''$. Unde spatio annorum centum Ecliptica mutat latitudinem suam (si ita loqui fas est) quantitate $15''.9'''$, vel potius stella in communi sectione Eclipticæ et orbitæ Jovis locata paulatim ab Eclipticâ recedere cernetur ità ut post centum annos ab eâ distabit angulo $15''.9'''$, atque ità per multa secula ferè æqualiter augebitur hujus stellæ latitudo: quin et tantundem augebuntur vel minuentur latitudines stellarum omnium parem cum nodis Jovialibus longitudinem habentium. Hæ igitur fixæ à tempore Hipparchi, id est, per annos 1900 circiter, latitudinem suam mutarunt quinque penè minutis primis. Pariter cum

arcus

arcus omnes inter circulos DE , dE , comprehensi ad circulum dE perpendiculares sint ut finus distantiarum ipsorum à puncto E , sive ut cosinus distantiarum ipsorum à nodo Jovis, incrementum decrementum latitudinis stellæ cujuscunque erit ad $15''.9'''$ ut cosinus differentiæ longitudinum stellæ ipsius et nodi proximi Jovis ad radium; ac proinde, datâ semel longitudine tum stellæ tum nodorum Jovis, dabitur variatio latitudinis stellæ pro tempore quolibet. Ex hoc principio computavimus variationem latitudinis siderum pro singulis quinque gradibus longitudinis, qualis exurgere debeat lapsu sæculi proximè venturi ab anno 1750 incipientis ad annum 1850 absolvendi; in hypothese quod nodus Jovis ascendens anno 1800 occupabit nonum gradum Cancræ, sicuti in tabulis Astronomicis ferè habetur.

Variatio Secularis latitudinis stellarum in parte Eclipticæ Boreali existentium												
Longi- tudo Stellar.	O	VI	II	VIII	IV	X	I	VII	III	IX	V	XI
	adde	Subt.	adde	Subt.	adde	Subt.	adde	Subt.	adde	Subt.	adde	Subt.
0	"	"	"	"	"	"	"	"	"	"	"	"
9	0. 0	13. 8	13. 8	7. 35	15. 9	7. 35						
14	1. 19	13. 44	12. 25	8. 41	15. 6	6. 24						
19	2. 38	14. 14	11. 36	9. 44	14. 55	5. 12						
24	3. 55	14. 38	10. 43	10. 43	14. 38	3. 55						
29	5. 12	14. 55	9. 44	11. 36	14. 14	2. 38						
Longi- tudo Stellar.	I	VII	III	IX	V	XI	II	VIII	IV	X	O	VI
	adde	Subt.	adde	Subt.	adde	Subt.	adde	Subt.	adde	Subt.	Subt.	adde
4	6. 24	15. 6	8. 41	12. 25	13. 44	1. 1						
9	7. 35	15. 9	7. 35	13. 8	13. 8	0. 0						
Pro stellis Australibus mutanda sunt signa additionis et subtractionis.												

Hic locus effert consensum Theoriæ cum Phænomenis ostendere: sed præterquam quod id vetat inopia Observationum antiquorum satis accuratè habitarum; ineffe stellis quibusdam motum aliquem, quem discernere oporteret, magis notabilem advertit Ill. Bradleius, quemque à qualicumque mutatione in motu terrestri non pendere existimat. Itaque in Phænomeni hujus elucidationem ulteriori ope ab Astronomis sperandâ indigemus.

PROPOSITIO III. PROBLEMA.

Variationem Obliquitatis Eclipticæ ex viribus prædictis oriundam determinare.

Quando-

Quandoquidem ex propositione præcedente Ecliptica sensim mutat situm suum, inde generatim patet variari etiam debere inclinationem ejus ad Æquatorem: qualis autem et quanta sit Variatio hæc ut investigemus, fit VED (Fig. 3.) Ecliptica, JD orbis Jovis secans eclipticam in D , QL Æquator, et L punctum Æquinoctiale. Sunt DE et LV quadrantes circuli, et si per temporis particulam intelligatur nodus D transferri motu suo medio in d , circulus dEt descriptus per puncta d , E , exhibebit situm eclipticæ elapso illo tempore; et si in eundem demittantur perpendiculara Dg , Vt , posterius Vt exhibebit variationem obliquitatis eclipticæ eodem tempore genitam. Scripto igitur s pro sinu inclinationis orbis Jovis ad Eclipticam, existente radio 1, erit in triangulo Ddg , $Dd:Dg::1:s$; sed est $Dg:Vt::1:\text{Sin. } EV$; unde erit $Dd:Vt::1:s \times \text{Sin. } EV$; at ob $DE=LV$, est $DL=EV$, adeoque fit $Dd:Vt::1:s \times \text{Sin. } DL$, hincque patet variationem momentaneam obliquitatis Eclipticæ esse ut finus distantie nodi Jovis ab Æquinoctio.

Ducatur jam LC ad centrum sphaeræ C , et in LC perpendicularum DK ; atque ob motum regressivum tum nodi D tum æquinoctii L , velociorem autem æquinoctii quam nodi, puncta D , L , ad se mutuò accedunt vel a se recedunt differentiâ velocitatum: fingamus igitur alterutrum v.g. nodum D moveri cum hac differentiâ velocitatum, stante æquinoctio L immoto, et esto De arcus quam minimus hac velocitatum differentiâ descriptus, et in LC demisso perpendicularo ek , habetur $De:Kk::1:DK$ vel $\text{Sin } DL$, unde est $Dd:Vt::De:s \times Kk$, et summa variationum omnium Vt , quo tempore punctum D differentiâ prædictâ velocitatum descripserit arcum quem-

quemvis DH , erit ad summam totidem motuum nodi D , id est, variatio obliquitatis eclipticæ eo tempore genita erit ad motum nodi, ut summa omnium Kk ducta in sinum s ad summam totidem arcuum De , hoc est, ducto in LC perpendicularo HM , ut factum $s \times KM$ ad arcum DH . Si denotaverit igitur N motum nodi Jovis, quo tempore descriptus fuerit arcus DH , variatio inclinationis Eclipticæ ad Æquatorem eodem tempore genita erit $\frac{N \times KM \times s}{DH}$. Hinc-

que cum $\frac{N}{DH}$ exprimat rationem motûs nodi ad differentiam motuum nodi et æquinoctii, et KM sit differentia vel summa cosinum distantiarum punctorum D et H ab æquinoctio, prout puncta K et M jaceant ad easdem vel diversas partes centri C , nascitur Theorema sequens: *Est radius ad sinum inclinationis orbitæ Jovis ad Eclipticam ut differentia vel summa cosinum distantiarum Nodi ab Æquinoctio in principio et fine temporis dati ad sinum quendam; deinde, est differentia motuum Nodi et Æquinoctii ad modum nodi ut sinus mox inventus ad sinum Variationis Obliquitatis Eclipticæ.*

Pro nodo et inclinatione orbitæ Jovis substituantur nodus et inclinatio orbitæ Saturni, atque idem Theorema dabit variationem Obliquitatis Eclipticæ quam generat Saturnus. *Q. E. I.*

COROLL. I.

Nodus D in dictâ figurâ est nodus descendens Jovis, et L punctum Æquinoctii Verni; unde et ex ratiocinio problematis patet, quamdiu nodus D et æquinoctium L ad se accedunt, decrescere inclinationem Eclipticæ ad Æquatorem; eandem autem

crescere, ubi prædicti nodus et æquinoctium recedunt à se invicem : vel, quod eodem recidit, in transitu nodi ascendentis orbis Jovialis ab Æquinoctio Vernali ad Autumnale semper minuitur Obliquitas Eclipticæ, et in transitu ejusdem nodi ab Æquinoctio Autumnali ad Vernale augetur.

COROLL. II.

Si puncta *D* et *H* fuerint sita ex diversis partibus puncti Æquinoctialis, id est, si nodus intra tempus propositum transierit per Æquinoctium, patet ex Coroll. præced. Obliquitatem Eclipticæ partim crevisse partim decrevisse : quo in casu incrementi ac decrementi differentia dabitur per Theorema superius ; sed et habebitur horum summa sive variatio tota Obliquitatis eo tempore genita, si loco differentiæ vel summæ cosinum distantiarum nodi ab æquinoctio substituaturs in Theoremate prædicto summa sinuum versorum earumdem distantiarum, ut satis patet.

Ratiocinium utriusque Corollarii obtinet etiam pro Saturno.

SCHOLIUM I.

Cum fuerit multum disceptatum inter Astronomos et veteres et recentiores de variâ vel constanti Eclipticæ Obliquitate, et neminem noverim, qui Phænomenon hoc juxta leges gravitatis expenderit, hac propositione lubuit ejus investigationem pertentare.

Porro cum nodus ascendens Jovis nunc temporis versatur in signo Cancræ, patet per Coroll. 1. propositionis hujus à multis seculis semper decrevisse Obliquitatem Eclipticæ. Sed ut specialius hoc exponatur :

tur: Motus secularis nodi Jovialis ex prop. 2. est $10'.22''\frac{1}{2}$, et motus æquinoctii, annuo existente $50''$, eodem tempore est $10.23'.20''$, adeoque differentia motuum nodi et æquinoctii est ad motum nodi ut 7,0331 ad 1; quare tempus transitus nodi ab æquinoctio verno ad autumnale, quod constituit terminum imminutionis Obliquitatis Eclipticæ, erit annorum 14803, sepositâ acceleratione modicâ vi Saturni debitâ: existente igitur nunc nodo Jovis in $8^{\circ}\frac{1}{2} 69$, ab annis 8000 (si tanta supponatur Mundi ætas) decrevit Eclipticæ Obliquitas, ac per annos 6000 et amplius decrescere debet, nec nisi post periodum annorum 29606 pristinum situm recuperabit. Tota verò imminutio, quam prædicto tempore in Obliquitate Eclipticæ generare potest vis Jovis, prodit per Theorema in propositione traditum $22'.30''$. Hæc igitur est variatio maxima.

Si desideretur decrementum factum in Obliquitate Eclipticæ spatio annorum mille proximè elapsum, ità facillè computabitur. Motus nodi Jovis ex prop. 2. in annis mille est $1^{\circ}.43'.44''$; præcessio autem æquinoctiorum eodem tempore $13^{\circ}.53'.20''$, atque horum motuum differentia $12^{\circ}.9'.36''$; unde posito loco nodi initio anni 1755 in $8^{\circ}.20'$ Cancri juxta tabulas Astronomicas Cl. *Halleii*, distantia nodi ab æquinoctio initio et fine temporis dati fuerunt $93^{\circ}.49'.36''$, et $81^{\circ}.40'$: indeque per Theorema præfatum prodit decrementum quæsitum ex vi Jovis $2'.22''.56''$. Simili modo motus nodi Saturnii ex prop. 2. in annis mille est $5'.56''\frac{1}{2}$; unde differentia inter motum nodi et motum æquinoctii est ad motum nodi ut 139,265 ad 1: distantia autem nodi ab æquinoctio initio et fine temporis dati, posito nodo juxta

juxta easdem tabulas in $21^{\circ}.21'.36''$ Cancrî initio anni 1755, hac ratione forent $68^{\circ}.38'.24'$ et $82^{\circ}.25'.48''$; hincque, existente inclinatione orbis Saturni ad Eclipticam $2^{\circ}.30'.10''$, per idem theorema decrementum vi Saturniâ genitum exurgit $15''.2'''$. Adeoque decrementum totum Obliquitatis Eclipticæ annis mille proximè elapsis factum ex viribus conjunctis Jovis et Saturni evadit $2'.38''$. A tempore igitur *Hipparchi* imminuta est Obliquitas Eclipticæ minutis circiter quinque primis.

Haud fecùs, si nodus Jovis ascendens initio anni 1750 constituatur in $8^{\circ}.15'.50''69$, et nodus Saturni in $21^{\circ}.20'.6''69$, prout exhibent tabulæ *Halleianæ*, computatur tabella sequens

Ab anno ineunte	Ad annum ineuntem.	Decrem. Obliq. Ecl. vi Jovis	Decrem. Obliq. Ecl. vi Saturn.	Totum Decrem. Obliq. Eclipt.
1750	1800	- $7''.6'''$	- - $0''.44'''$	- - $7''.50'''$
1800	1900	14. 9	- - 1. 27	- - 15. 36
1900	2000	14. 5	- - 1. 26	- - 15. 31

Collatio Theoriæ cum Phænomenis.

Ut adæquata theoriæ cum phænomenis collatio institueretur, Observationes Veterum consulendæ forent et cum Nuperis comparandæ; sed illæ imperfectiores sunt quam quæ in minutis hujusmodi quantitibus definiendis inserviant. Recentiorum itaque unam et alteram, minùs adeò idoneas, afferre sufficiat.

1°. Refert Cl. *Le Monnier* in Actis Acad. Paris, an. 1738 altitudinem centri solis in solstitio æstivo versantis anno 1669 à *Picarto* Parisiis mensuratam fuisse $64^{\circ}.39'.0''$, et anno 1670 $64^{\circ}.38'.58''$: mediam fumamus $64^{\circ}.38'.59''$. Ipsemet *Le Mon-*

nier solis limbi superioris altitudinem (uti habetur in actis ejusdem Acad. an 1743) in solstitio æstivo anni 1743 reperit $64^{\circ}.54'.35''$, adeoque altitudinem centri solis $64^{\circ}.38'.45''$. Locus autem nodi ascendentis lunæ medio *Picarti* Observationum tempori respondens erat $27^{\circ}.7'$ circiter, et $16^{\circ}.8'$ tempore solstitii æstivi anni 1743 : unde in priori casu Nutatio axis Terrestris erat $8''$, totâ existente $18''$, et in posteriori $6''.15'''$; atque his quantitibus respectivé ablatis, altitudo solis prior evadit $64^{\circ}.38'.51''$, posterior $64^{\circ}.38'.38''.45'''$, quarum differentia $12''.15'''$ est decrementum factum in obliquitate mediocri Eclipticæ intervallo annorum $73\frac{1}{2}$. Per propositionem nostram decrementum vi Jovis genitum pro eodem temporis intervallo est $10''.27'''$, et vi Saturni $1''.5'''$: Totum igitur decrementum Obliquitatis Eclipticæ juxta theoriam fit $11''.32'''$.

2^o. Ex Observationibus *Waltheri* solertissimé inter se comparatis colligit acutissimus Astronomus *De La Caille* (in Actis Acad. Paris. an. 1749) inclinationem Eclipticæ ad Æquatorem circa annum 1496 fuisse $23^{\circ}.29'.32''$, quæ nunc temporis æstimatur $23^{\circ}.28'30''$, adeoque annis 260 decrevit Obliquitas Eclipticæ minuto uno primo circiter. Per Theoriam nostram decrementum illud vi Jovis foret $37''.2'''$, et vi Saturni $3''.50'''$; unde decrementum totum tempore prædicto evaderet $40''.52'''$ five $41''$ circiter. Si loco tabulæ refractionum *Cassinianæ Newtonianæ* usurparetur, Obliquitas Eclipticæ ex Observationibus *Waltheri* deducta minor evaderet minutis aliquot secundis, adeoque ad determinationem nostram propius accederet. Cæterum propter incertitudinem refractionum et latitudinum locorum, ex Observationibus in Sol-

stitiis.

stitiis *Æstivalibus* eodem loco habitis Variatio Obliquitatis *Eclipticæ* tutissimè definiri videtur.

Si variatio ex *Observationibus* tandem accuratè derivata superaverit, uti in exemplis allatis, variationem, quam assignat hæc theoria, excessus ille debitus erit actionibus planetarum Martis et Veneris, quæ quidem, cum amborum nodi ascendentes intra prima sex signa versentur, ad imminuendam Obliquitatem *Eclipticæ* etiam conspirant. Quapropter, si quando *Observationibus* accuratè poterit innotescere tam hæc variatio quam progressus Aphelii terræ, planetarum item Martis ac Veneris tum demum et vires cognoscere et moles ponderare licebit.

PROPOSITIO IV. PROBLEMA.

Motum *Æquinoctiorum* causis prædictis debitum determinare.

Hic non investigatur motus puncti *Æquinoctialis*, quatenus *Æquator* terræ ob materiam ibi redundantem vi Jovis et Saturni mutaret situm suum respectu *Eclipticæ*, quemadmodum viribus Solis et Lunæ fieri innotescit; hujusmodi enim mutatio ex actionibus Jovis vel Saturni oriunda omninò debet esse insensibilis: sed motum illum *Æquinoctii* quærimus, qui oritur ex variatione, quam fieri in situ plani *Eclipticæ* suprà monstravimus.

Isdem igitur manentibus ac in propositione præcedente, ex puncto *m* ubi *Æquator* secat circulum *dE* demittatur in *DE* perpendiculum *mn*, et quia est $Dg \underline{mn} :: 1 : \text{Cos. } DL \text{ five } CK, \text{ et } Dd : Dg :: 1 : s,$

erit $Dd:mn::1:s \times CK$, vel ducto radio CS perpendiculari ad CL , et ad CS rectis perpendicularibus DR , er , HG , erit $Dd:mn::De:s \times Rr$; adeoque erit summa omnium mn , quo tempore differentiâ motuum $\text{\AE}quinoctii$ et Nodi describitur arcus DH , ad summam totidem Dd ut summa omnium Rr ducta in s ad summam totidem arcuum De , hoc est, ut factum $s \times RG$ ad arcum DH . Igitur summa omnium mn , id est, Latitudo puncti $\text{\AE}quinoctialis$, ut ita dicam, sive distantia ejus à plano DCE spectato ut immoto, est æqualis $\frac{N \times RG \times s}{DH}$, exhibente scilicet N motum nodi, quo tempore describitur arcus DH . Unde, cum RG æquetur differentiæ vel summæ sinuum arcuum DL , HL , prout puncta R , G , jaceant ad easdem vel diversas partes centri C , circulo ID exhibente orbitam vel Jovis vel Saturni, confit Theorema sequens: *Est radius ad sinum inclinationis orbitæ Jovis vel Saturni ad Eclipticam, ut differentia vel summa sinuum distantiarum nodi ab Æquinoctio in principio et fine temporis dati ad sinum quemdam: deinde, est differentia motuum Nodi et Æquinoctii ad motum nodi ut sinus mox inventus ad sinum variationis Latitudinis puncti Æquinoctialis.* Vel etiam quia variatio Obliquitatis Eclipticæ est ex propositione præcedente æqualis $\frac{N \times KM \times s}{DH}$, et variatio Latitudinis puncti $\text{\AE}quinoctialis$ æqualis $\frac{N \times RG \times s}{DH}$, habetur illud alterum Theorema: *Est variatio Latitudinis puncti æquinoctialis ad variationem Obliquitatis Eclipticæ ut summa vel differentia sinuum distantiarum nodi ab æquinoctio initio et fine temporis dati*
ad

ad summam vel differentiam cosinuum earundem distantiarum.

Tum, quia est semper Ln ad mn ut cosinus inclinationis Eclipticæ ad Æquatorem ad ejusdem inclinationis sinum, five ut radius ad tangentem ejusdem inclinationis, erit summa omnium Ln tempore dato, hoc est, variatio puncti Æquinoctialis secundum Longitudinem a puncto fixo in plano DCE mensuratam ad ejusdem variationem secundum Latitudinem in eadem ratione, ideoque datur. *Q. E. I.*

COROLL.

Hinc sequitur variationem puncti Æquinoctii Verni secundum latitudinem à plano immoto computatam semper fieri Boream versus in transitu nodi ascendentis Jovialis vel Saturnii à Solstitio Æstivo ad Hybernium, et Austrum versus ubi idem nodus transit a Solstitio Hyberno ad Æstivum. Contrarium dici debet de puncto Æquinoctii Autumnalis: variationem autem puncti Æquinoctialis secundum longitudinem à loco dato in plano illo immoto numeratam fieri in priori casu contra, in posteriori secundum seriem signorum; hoc est, in priori casu regreditur Æquinoctium, in posteriori progreditur.

Si puncta D et H sita fuerint ex diversis partibus puncti Solstitialis, id est, si per tempus propositum Nodus transferit in signum Cancræ vel Capricorni, Theoremata in propositione tradita dabunt differentiam variationum contrarium puncti æquinoctialis; sed et summa ipsarum quo pacto haberi possit facile patet.

SCHOLIUM.

Quum in decursu annorum mille proximè elap-
 sorum nodus Jovis ascendens subierit signum Cancrī,
 ac propterea Variationes præfatæ non in eundem toto eo
 tempore factæ fuerint sensum, quæramus quales eva-
 serint per annos quingentos ab initio anni 1755 re-
 trorsum numeratos: quo in casu differentia motuum
 nodi Jovialis et æquinoctii, per scholium prop. præ-
 cæd. extitit $6^{\circ}.4'.48''$; unde cætera, ut ibi, profe-
 quendo prodit per utrumvis theorema in propositione
 hac traditum Variatio puncti æquinoctii Verni se-
 cundum latitudinem Boream versus æqualis $6''.37'''$,
 hincque variatio secundum longitudinem æqualis
 $15''.14'''$, vi Jovis.

Addantur in priori casu pro vi Saturni $2''.26'''$, et
 in posteriori $5''.36'''$, atque evadet tota variatio
 puncti æquinoctialis secundum latitudinem annis
 quingentis proximè elapsis facta æqualis $9''.3'''$, et
 Retrogressio ejusdem puncti $20''.50'''$. Hujusmodi
 igitur Variationes nonnisi perlongo tem poris inter-
 vallo sensibiles sunt.

PROPOSITIO V. PROBLEMA.

Errorum Terrestrium æquationes investigare.

Errorum angularium Æquationes maximæ, cum
 et ipsæ sint errores angulares, sunt directè ut vires et
 quadrata temporum, quibus generantur, conjunctim,
 et inversè ut orbium diametri; ideòque sunt ut ipsi
 errores sive motus, quorum sunt æquationes, tem-
 poribus istis geniti: tempora autem ipsa sunt quam-
 proximè ut æquationum periodi. Unde ob datos
 motuum lunarium et terrestrium errores, æquatio-
 numque

numque periodos, ex datis errorum lunarium æquationibus per analogiam eruentur æquationes errorum terrestrium.

Sic, periodus æquationis Apogæi lunaris et Variationis Æquationis centri lunæ cum sit proportionalis revolutioni solis ad Apogæum lunæ, ac propterea ob similitudinem virium similiter applicatarum periodus æquationis Aphelii terræ et Variationis æquationis centri proportionalis esse debeat revolutioni Jovis ad terræ Aphelium, erunt æquationes istæ lunares ad æquationes hæc terræ similes, ut motus Apogæi lunaris tempore revolutionis solis ad lunæ apogæum, ad motum Aphelii terræ tempore revolutionis Jovis ad ipsum terræ Aphelium, hoc est, existente motu medio Apogæi lunaris annuo $40^{\circ}.40'.43''$ et motu annuo Aphelii terræ supra invento $13''.2''' . 28^{iv}$, ut $45^{\circ}.51'.40''$ ad $2'.34''.42''$. Quare positâ variatione totâ æquationis maximæ centri lunæ æquali $2^{\circ}.41\frac{1}{2}'$ prout ferè habetur in tabulis Astronomicis, erit variatio æquationis maximæ centri Terræ sive Sol's $9''.4'''$.

Denotet igitur \mathcal{A} æquationem centri solis maximam mediocrem, eritque $\mathcal{A} + 4''.32'''$ æquatio maxima, et $\mathcal{A} - 4''.32'''$ æquatio minima; atque his æquationibus dabuntur etiam excentricitates congruæ.

Tum, quemadmodum variatio æquationis maximæ centri lunæ crescit in ratione duplicatâ sinûs distantiae Apogæi lunaris à quadraturis suis cum sole, ita variatio æquationis maximæ centri solis, id est, incrementum æquationis minimæ augetur in ratione duplicatâ sinus distantiae aphelii terræ a quadraturis suis cum Jove: five, variatio æquationis mediæ est ad se-

missam.

missiẽm variationis totius, nempe ad $4''.32'''$, ut cosinus duplæ distantie Jovis ab Aphelio terræ ad radium; et additur æquationi mediæ, ubi linea Apſidum Orbis magni pergit ab octantibus suis cum Jove ad syzygias, vel a syzygiis ad octantes; in reliquâ parte subducitur. Utrum autem tantilla variatio Observationibus patere possit, Astronomis definiendum relinquo.

Haud secus, si æquatio maxima apogæi lunæ statuatur $12^{\circ}.18'$ erit $45^{\circ}.51'.40''$ ad $2'.34''.42'''$ ut $12^{\circ}.18'$ ad æquationem maximam motus Aphelii terræ sive Apogæi solis, quæ proinde erit $41'',30''$, ubi scilicet Apſides Orbis Telluris versantur in octantibus suis cum Jove. In aliis positionibus æquatio Aphelii erit ad æquationem maximam ut sinus duplæ distantie Jovis ab aphelio terræ ad radium; motui verò medio additur in transitu apſidum orbis magni a syzygiis suis cum Jove ad quadraturas, et in transitu a quadraturis ad syzygias subducitur, ac proinde in casu quolibet habebitur verus Aphelii terræ sive Apogæi solis locus.

Hoc pacto confecimus tabulam sequentem, si forte usui esse possit, in quâ \mathcal{A} denotat æquationem centri solis maximam mediocrem.

Distantia Jovis ab Apogæo Solis							
O VI		I VII		II VIII			
Gr.	Æquatio Apog.Sol. Adde	Æquatio Centri Solis	Æquatio Apog.Sol. Adde	Æquatio Centri Solis	Æquatio Apog.Sol. Adde	Æquatio Centri Solis	Gr
0	" "	Æ+4. 32	" "	Æ+2. 16	" "	Æ-2. 16	30
10	14. 11	Æ+4. 16	" "	Æ+0. 47	" "	Æ-3. 29	20
20	26. 40	Æ+3. 29	" "	Æ-0. 47	" "	Æ-4. 16	10
30	35. 56	Æ+2. 16	" "	Æ-2. 16	" "	Æ-4. 32	0
	Subtrahe		Subtrahe		Subtrahe		
V XI		IV X		III IX			

Simili modo erit Variatio lunæ Variationem solis ut motus medius Apogæi lunaris tempore revolutionis lunæ ad solem ad motum medium Apogæi solaris tempore revolutionis solis ad Jovem; ideoque cum motus apogæi lunaris tempore synodico sit $3^{\circ} 17' 20''$, et motus apogæi solaris sit $14'' 15'''$ quo tempore sol ad Jovem revolvitur, posita variatione maximâ lunæ $35' 10''$, prodit variatio maxima solis $2'' 32'''$, quæ locum obtinet, ubi sol versatur in octantibus cum Jove; in aliis locis variatio foret ad variationem maximam ut sinus duplæ distantiae solis à quadraturis suis vel syzygiis cum Jove ad radium quam proximè.

Item, si eadem esset excentricitas orbium Terræ ac Jovis, foret æquatio motûs medii Terræ sive solis, quæ oritur ex variâ contractione et dilatatione orbis magni per vim Jovis, ad similem æquationem lunæ, ut motus apogæi solis tempore revolutionis Jovis ad motum apogæi lunæ tempore revolutionis solis, hoc est, ut $2' 34'' 41'''$ ad $40^{\circ} 40' 43''$; sed hæc Æquatio solis augeri debet in ratione excentricitatis orbis Jovis ad

excentricitatem orbis terræ, five in ratione æquationis maximæ centri Jovis ad æquationem maximam centri Solis quamproximè, hoc est, in ratione $5^{\circ} 31'. 36''$ ad $1^{\circ} 66'. 20''$: unde si æquatio maxima medii motûs lunæ fuerit $11'. 50''$, erit æquatio maxima medii motus solis $2''. 8'''$, in mediocribus scilicet Jovis a sole distantis; in aliis locis æquationi centri Jovis proportionalis est. In his omnibus vim Saturni utpote insensibilem negligo.

Atque eâdem methodo ad alias Solis æquationes æquationibus lunaribus analogas procedere liceret, nisi in hujusmodi minutis exquirendis jam nimius effem: cum quæ in hac propositione recensentur, tametsi præ cæteris notabiles, Observationum Astro-nomicarum solertiam omnem fortasse fugere debeant: cæterum tales re ipsa esse scire juvat; et plures frustra commemorarem. *Q. E. I.*

CX. *A Journal of the Weather in Dublin
for the Year 1753; by James Simon,
F. R. S. and S. A.*

Read Nov. 4, 1756.

J A N U A R Y 1753.

D.	Morning.			Noon.			Night.			Wind
1	30	4	Fg	30	3	Fg Rn	30	1½	Rn	Var.
2	29	19	Cy Rn	29	17	Rn	29	15	Rn	ENE
3	29	14	Rn Hl	29	12	Sw Rn Hl	29	11½	Rn Sw Hl	ENE
4	29	13	Cy Rn	29	15	Cy Rn	29	17½	Fg	Var.
5	29	19½	Fg	29	19	Fg	29	19	Fg Ft	E
6	29	17	Fg ☉ Ft	29	17	Cy Ft	29	17	Fg Ft	SE
7	29	18	Fg	29	17½	Fg	29	18	Fg	NW
8	29	17	Fg	29	16	Cy	29	14	Cy	WNW
9	29	13	Cy ☉	29	11½	☉ Cy	29	7	Rn	WNW
10	28	19	Rn	28	16	Rn	28	12	Rn Wy	Var.
11	28	14	Wy ☉ Cd	28	18	☉ Cd	29	2	Fr Cd	WSW
12	29	5½	Rn	29	2½	Rn Wy	28	16	Rn Hl St	SE
13	28	10½	Fg Rn	28	18	Rn Wy	29	2½	Rn Wy St	WNW
14	29	8½	Fr ☉	29	9½	Fr ☉	29	12	Ft Fr	WNW
15	29	15	☉	29	16	☉	29	17	Fr Cd	WNW
16	29	14	Fr	29	11½	Fr	29	9½	Rn	S
17	29	12	Cy Rn	29	14½	Rn	29	17	Fr	NW
18	29	16	Fr Cd	29	14	Cy Cd	29	12½	Fg Cd	NW
19	29	12	Cy Rn	29	13	Sw Cd Ft	29	16	Fg Cd Ft	Var.
20	29	18	Fr Ft	29	18½	Ft Fg	29	17½	Fg Ft	WNW
21	29	15	Rn	29	16½	☉	29	18	Fr Ft	WNW
22	29	18	Fg Fr	29	18	Fr	29	18½	Fg Ft	Var.
23	29	19½	Fg Fr	29	19½	Fr	29	19½	Fg Ft	S
24	29	16½	Cy Wy	29	16	Cy Wy	29	16	Rn Wy	SE fr. ga.
25	29	14½	Cy Wy	29	13½	Rn	29	14½	Rn Wm	SW
26	29	18	Fr ☉	29	18	☉	29	16½	Fr Cd	SW
27	29	14	Cy Rn	29	11½	Cy Rn	29	11	Cy	SW
28	29	11	Cy ☉	29	12	Cy Cd	29	12½	Fr Cd	SSE
29	29	10	Cy Rn	29	8½	Rn Cy	29	7	Wy	SW
30	29	5½	Cy ☉	29	5	☉ Cy	29	4	Rn St	SW
31	29	3	Rn	29	4	Rn ☉	29	4	Fr Wy	WSW

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1753.

F E B R U A R Y 1753.

D ^s	Morning.		Noon.		Night.		Wind.	
1	29	7	Fr Wy	29 9	☉ Wy	29 7	St	WSW
2	29	7	Wy Fr	29 13½	☉ Wy	29 19½	Fr Ft	NNW
3	30	2	Fr ☉	30 3	☉ Ft	30 3½	Fg Ft	WNW
4	30	3	Ft	30 3	Rn	30 3	Fr Cd	S
5	30	2	Fr ☉	30 1	☉	29 19½	Ft Sw	SE
6	29	17	Ft Sw ☉	29 16	Sw ☉	29 15	Sw.	NNE
7	29	13	Sw	29 12	Sw	29 11	Rn	N
8	29	12	Fr	29 12	Fr	29 12½	Fr	SE
9	29	13½	Fr ☉	29 14	☉	29 15	Fg	E
10	29	14½	Cy ☉	29 14	☉	29 13	Fg Cd	WNW
11	29	11½	Hl Rn Sw	29 10½	Sw Rn	29 9	Sw	ENE
12	29	7	Sw Rn	29 5	Hl Sw.	29 5	Sw	E
13	29	1	Rn	28 19	Rn	28 13	Rn Wy	Var.
14	28	9	Cy Wy	28 12	☉	28 16½	Fr Wy.	W.
15	28	19	Fr ☉	29 2	☉ Cd	29 4	Fr	Var.
16	28	17	Rn St.	28 16	☉ Rn St	29 1	Fr Wy.	SW
17	29		Fr ☉	28 18	Cy Rn	28 15	Rn	WSW
18	28	14½	☉	28 14	☉ Rn Hl	29	Fr.	W
19	29	2	☉	29	☉ Cy	28 15	Rn	E
20	28	16	☉	28 15	Rn St.	28 18	Rn St.	SW
21	29	9	☉	29 14	☉	29 14	Rn Fr	WNW
22	29	15	Cy Rn	29 12	Rn	29 7½	Fr Cy	SE
23	29	5	☉	29 17	☉	29 17	Fr	WNW
24	30		☉	29 18	☉	29 17	Fr Wy	Var.
25	29	17	☉ Cd	30 1	☉ Cd	30 5	Fg	Var.
26	30	6	☉	30 6½	☉	30 6	Fr Cd	E
27	30	6	☉	30 5	☉	30 4	Fr Fr	E
28	30	3	☉	30 3	☉	30 2.	Fr Ft	E

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MARCH 1753.

D ^s	Morning.		Noon.		Night		Wind.
1	30	Cy Rn	29 19½	Rn Sw	29 19½	Rn Sw	E
2	29 19	Cy	29 18	Cy	29 16	Cy	E
3	29 16	Cy ☉	29 17	☉ Cy	29 18	Fr	Var.
4	29 19	Fg ☉	29 18½	☉	29 19	Fg	SE
5	29 19½	Fg ☉	30	☉	30	Fr	Var.
6	30 3	Cy Rn	30 5	Cy	30 5	Cy Fg	E
7	30 6	Fg ☉	30 7	☉	30 7	Fg	E
8	30 6	Fg ☉	30 6	☉	30 5	Fr	E
9	30 4	☉	30 3	☉	30 2½	Fg	LSE
10	30	Fg ☉	29 18	☉ Cy	29 17	Wy	ESE
11	29 15	Cy ☉	29 13	Cy.	29 8	Cy Wy	SSW
12	29 2	Cy Rn	29 7	Rn Fr	29 10	Fr	W
13	29 10	Cy Rn	29 9	☉	29 9	Rn	WSW
14	29 9½	Cy ☉	29 9½	Rn ☉	29 8	Rn Wd	WSW
15	29 10	☉ Wd	29 10	☉ Wd Cd	29 4	Rn St	WSW
16	28 18	Rn St	29 2	☉ Rn	29 2	Rn Wd	WSW
17	29 2½	Cy ☉	29 2	☉ Rn	29 5	Rn	WSW
18	29 4	☉ Cy Rn	29 6	Rn ☉	29 13	HI Rn Cd	W. W
19	29 18	☉	29 18	☉	29 16	Fr Wd	WSW
20	29 14	Cy ☉	29 12	Cy St	29 11	Rn St	WSW.
21	29 13½	Cy ☉	29 16	Rn ☉	29 18	Cd Fg	WNW.
22	29 16	☉	29 12	Rn	29 12	Rn	SE
23	29 11	Cy ☉	29 8	Cy Rn	29 4	Rn Wd	ESE
24	29 3	Cy ☉	29 5	☉	29 8	Fr Fg	W
25	29 8	☉ Rn	29 4	Rn ☉	29 2	Rn Wd	S
26	29 4½	Cy ☉	29 8	☉ Rn HI	29 10	Rn Fr	WSW
27	29 10	☉ Rn	29 10	☉ Rn	29 9	Fr Wd	S
28	29 6½	Cy	29 5	Cy	29 6	Fr	SSE
29	28 18	Wd Rn	28 15	Rn	29 2	Fr Wd	E
30	29 4	☉ Rn	29 5	☉ Rn	29 4	Fr	E
31	29	Wd Rn	29 2	Rn HI	29 5	HI Fr	ESW.

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A P R I L 1753.

D ^y	Morning.		Noon.		Night.		Wind.			
1	29	8	☉ Cd	29	8	☉ Cd	29	2	Rn Wd	WSW
2	29	3	Rn ☉	29	3	☉	29	4	Wd Cd	WNW
3	29	4	☉ Hail	29	4	Rn Hl ☉	29	3	Fr	WNW
4	28	16	Rn ☉	29	2	☉	29	4	Rn Cd	NE
5	29	6	☉ Cd	29	6	☉ Cd	29	8	Fr Fg	WNW
6	29	9	☉ Hl	29	10	☉ Hl Rn	29	13	Fr Fg]	WNW
7	29	15	☉	29	16	☉ Cy	29	16	Fr	NNW
8	29	14	☉	29	14	☉ Hl Rn	29	17	Fr Cd	N
9	29	18	Cy ☉	29	19½	☉	29	19½	Fr Cd	NNE
10	29	17	Cy Hl Rn	29	14	Hl Rn ☉	29	14	Rn Fr	NNW
11	29	12½	Cy Hl Rn	29	14	☉ Rn	29	13	Hl Rn	NE
12	29	15	Cy ☉	29	15	☉	29	15	Fr Fg	ENE
13	29	13	Cy Rn	29	9	Rn	29	8	Rn	W
14	29	9	Cy ☉ Rn	29	10	☉	29	12	Fr	W
15	29	11	☉	29	11	☉	29	8	Rn	NE
16	29	4	Cy Rn	29	3	Rn	29	4	Cy	WSW
17	29	3	Cy ☉ Rn	29	2	Rn ☉	29	7	Fr	SW
18	29	8	Cy ☉ Rn	29	10	Cy ☉ Rn	29	11	Fr	WSW
19	29	12½	Fr Cy	29	12½	Cy ☉	29	13	Fr Rn	SSW
20	29	13	Cy ☉	29	16	☉	29	17	Fr	SW
21	29	17	Cy ☉	29	17	☉ Rn	29	17	Cy Rn	SW
22	29	16	Cy	29	15	Cy	29	14	Cy Rn	SW
23	29	14	☉	29	14½	☉	29	14½	Fr Rn	WSW
24	29	13	Cy ☉	29	12	Rn Cy ☉	29	11	Cy Rn	W
25	29	5	Rn	29	3	Rn	29	5	Cy Fr	S
26	29	4	Cy Rn	29	5	Rn ☉	29	7	Fr Fg	Var.
27	29	8	Cy ☉	29	8	☉	29	7	Rn	SE
28	29	8	Cy	29	8	Rn	29	10	Fr	W
29	29	10	☉ Hl Rn	29	10	Cy Rn	29	9	Cy Wd	WSW
30	29	7	Cy ☉	29	11	☉ Rn	29	14	Fr	WSW

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M A Y 1753.

D ^s	Morning.		Noon.		Night.		Wind.
1	29 14	Cy	29 13	Cy Rn	29 14	Cy Rn	W
2	29 14	Rn	29 17	Rn Cy	30	Fr	WNW
3	30 2½	☉	30 3½	☉	30 4	Fr	NW
4	30 4	☉	30 4	☉	30 5	Fr	E
5	30 6	☉ Cd	30 6	☉ Cd	30 6	Fr Cd	E
6	30 6	☉ Cd	30 3	☉	30 3	Fr Cd	E
7	30 1½	☉	30 1	☉	30	Fr	E
8	30	☉	30	☉	30	Fg	E
9	29 19½	☉	29 19	☉	29 18	Fr	E
10	29 17	Cy ☉ Rn	29 15	☉ Rn	29 16	Cy Cd	W
11	29 15	☉ Hl	29 15	☉ Rn	29 15	Cy Cd	W
12	29 13	Cy Rn	29 12	Cy ☉ Rn	29 12	Rn Cy Cd	S
13	29 8	Rn St	29 8	Rn ☉ Wd	29 10	Fr Cd	W
14	29 10	☉ Rn	29 11	Cy Rn	29 9½	Cy Wd Cd	W
15	29 4	St Rn	29 3	Wd Hl Rn	29 4½	Wd Cd	W
16	29 5	Wd ☉ Cy	29 6½	☉ Cy Rn	29 8	Cy Rn	W
17	29 10	☉ Cd Rn	29 10½	☉ Rn	29 11	Fr	WNW
18	29 12	Rn Hl	29 13	Rn ☉	29 16	Fr	WNW
19	29 16	Cy Rn	29 15	Rn	29 14	Cy Rn	SSE
20	29 16	Wd ☉	29 17	☉	29 16	Rn	WNW
21	29 14	Rn Cy	29 15	Rn Hl	29 17	Fr	W
22	30	☉	30 2	☉	29 3	Fr Ht	Var.
23	30 4	☉	30 4	☉	30 4	Fr Ht	ESE
24	30 3	☉	30 2	☉ Cy	30 1	Cy	SSE
25	29 19	☉	29 18	☉	29 18	Fr Ht.	SSE
26	29 18	Cy ☉	29 16½	☉	29 16	Fr Ht	E
27	29 16	☉ Cy	29 16	☉ Cy	29 18	Cy	Var.
28	29 19½	Cy ☉	30 1	Cy Rn	30 2	Fr	Var.
29	30 4	Cy ☉	30 4	☉	30 5	Fr	Var.
30	30 4	Cy ☉	30 3½	☉ Cy	30 3	Cy	Var.
31	30 2	☉	30 1	☉	29 19½	Cy	ENE

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J U N E 1753.

D ^y	Morning.	Noon.	Night.	Wind.
1	29 18½ ☉	29 18 ☉ Ht	29 18 Cy	NE
2	29 18 ☉	29 18 ☉ Ht	29 19 Fr	NE
3	29 19½ ☉	30 ☉ Ht	29 19½ Fr	ENE
4	29 19 ☉ Cy	29 19 Cy Rn ☉	29 17 Cd Cy	E
5	29 17 Cy	29 18 ☉	29 19 Fr	NW
6	29 19 Cy	29 19½ Cy	29 19½ Cy Cd	Var.
7	29 19 ☉	29 18½ ☉	29 17½ Fg	E
8	29 17 ☉	29 17 ☉ Ht	29 17 Cy Cd	WSW
9	29 17 ☉ Cy	29 18 Cy Rn	29 18½ Cy Ht	SW
10	29 18 Cy	29 19 Rn Cy Ht	29 18½ Cy Ht	Var.
11	29 18 ☉	29 17½ ☉	29 17 Fr Cd	E
12	29 16 Cy Rn	29 16 Rn Cy	29 16 Cy Cd	E
13	29 14½ Cy ☉	29 14 ☉ Cy	29 15 Cy Rn	Var.
14	29 17½ ☉	29 18 ☉	29 18½ Fr Cd	NNW
15	29 17½ Cy Rn	29 17½ Cy ☉	29 18 Fr Cd	NNW
16	29 17½ Cy ☉	29 17 ☉ Ht	29 16 Fr Cd	Var.
17	29 13 Rn Cy	29 12 Rn Cy	29 17½ Fr Cd	Var.
18	30 ☉ Cd	29 19½ ☉ Cy	30 Fr Cd	E
19	30 ☉ Cd	30 Cy Cd	30 Fr Cd	W
20	29 18 Rn	29 15 Rn	29 14 Cy Cd	Var.
21	29 12½ ☉ Cd	29 13 Cy ☉ Hl	29 14 Cy Cd	NW
22	29 13 Cy Cd ☉	29 11½ Rn ☉	29 10 Cd	WNW
23	29 11 ☉ Wd Cd	29 12 ☉ Cy Cd	29 13 Fr Cd	NW
24	29 13½ Cy ☉ Wm	29 13 Cy Fr	29 13 Fr Cd	Var.
25	29 12½ ☉ Cy	29 12 Thd Hl Rn	29 12 Cy	Var.
26	29 12½ Cy	29 12½ Cy	29 11½ Rn Cy	SW
27	29 10 Cy Wd Rn	29 10 Rn	29 11 Cy	SSE
28	29 13 ☉ Rn	29 15 ☉ Rn	29 16 Fr	Var.
29	29 16½ ☉	29 17 ☉	29 16½ Fr Rn	S
30	29 16 Cy Rn	29 17 Rn Cy	29 17 Cy	S

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J U L Y 1753.

D	Morning.		Noon.		Night.		Wind.
1	29 17	Rn	29 16	Rn Cy	29 16	Rn Cd	S
2	29 14	⊙ Cy	29 12	⊙ Cy	29 10	Rn Cd	ESE
3	29 8	Cy ⊙	29 10	⊙	29 10	Fr	ESE
4	29 10	⊙	29 10	Cy Rn	29 9	Rn Cy	ESE
5	29 10	⊙ Cy Rn	29 10	Rn Cy	29 13	Fr	Var.
6	29 14½	Cy ⊙	29 13	Rn	29 16	Fr	SSE
7	29 15	Rn	29 13	Rn	29 11½	Rn	Var.
8	29 11	Rn	29 10½	Rn	29 11	Rn	Var.
9	29 12	⊙ Rn	29 11½	Rn	29 12	Fr	WSW
10	29 11½	⊙ Rn	29 11	Rn	29 9½	Rn	Var.
11	29 8	Cy Rn	29 8½	Rn ⊙	29 9½	Rn Fr	Var.
12	29 9½	Cy Rn	29 10½	Rn Fr	29 12	Fr	SW
13	29 13½	⊙ Rn	29 15	Rn Cy	29 16	Fr	Var.
14	29 14	Cy Rn	29 12½	Rn	29 10½	Rn	S
15	29 9	Cy ⊙ Rn	29 8	Rn ⊙	29 8	Rn	W
16	29 10	⊙ Rn	29 13	⊙	29 14	Fr	N
17	29 15½	⊙	29 15	⊙ Cy	29 16	Fr	ENE
18	29 16	⊙	29 16	⊙	29 16	Rn	Var.
19	29 16	Rn ⊙	29 16½	Cy ⊙	29 17½	Fr	Var.
20	29 19	Cy ⊙	29 19½	⊙ Cy	30 ½	Fr	NNW
21	30	Cy ⊙	30 ½	⊙	30 1	Fr	Var.
22	30	Cy ⊙	30	⊙ Ht	29 19½	Fr Cd	ESE
23	29 19½	⊙ Ht	30	⊙ Ht	30	Fr	NE
24	30	⊙ Ht	30 1	⊙ Ht	30	Fr	E
25	30	⊙ Ht	29 19½	⊙ Ht	29 19	Fr	E
26	29 18	⊙ Cd	29 17	⊙ Wm	29 17	Fr	NW
27	29 16	Cy ⊙	29 16	⊙	29 16	Fr	E
28	29 15	Cy ⊙	29 15½	Cy ⊙	29 16	Fr Cd	WNW
29	29 16	Cy ⊙	29 16½	⊙ Cy	29 17	Cy Cd	NE
30	29 16	Cy ⊙	29 16	⊙ Cy	29 16	Cy	NW
31	29 16	Cy ⊙	29 15	Cy	29 15	Cy	WNW

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AUGUST 1753

D ^s	Morning.	Noon.	Night.	Wind.
1	29 11 $\frac{1}{2}$ Rn	29 7 $\frac{1}{2}$ Rn	29 5 Rn	SSE
2	29 4 ☉ Cy Rn	29 5 ☉ Rn	29 6 Rn	W
3	29 8 ☉ Rn	29 9 ☉ Rn	29 10 Rn	WNW
4	29 6 Rn	29 3 $\frac{1}{2}$ Rn	29 Rn	E
5	29 Rn	29 2 ☉ Wd	29 6 $\frac{1}{2}$ Fr Wd	WNW
6	29 8 ☉ Rn	29 10 ☉ Rn	29 10 Fr Wd	WSW
7	29 9 $\frac{1}{2}$ Cy ☉ Rn	29 9 $\frac{1}{2}$ Cy ☉	29 9 Fr Cd	WSW
8	29 8 Cy	29 7 Rn	29 7 Cy Cd	ESE
9	29 7 Cy	29 8 Cy	29 9 Rn Cd	ESE
10	29 11 Cy Rn ☉	29 12 ☉	29 13 $\frac{1}{2}$ Fr	S
11	29 13 Cy ☉	29 14 ☉	29 15 Fr	Var.
12	29 15 Cy Rn ☉	29 13 $\frac{1}{2}$ Rn ☉	29 11 Rn	Var.
13	29 7 Rn ☉	29 5 ☉	29 4 $\frac{1}{2}$ Rn Cd	SE
14	29 3 $\frac{1}{2}$ Rn	29 6 Rn	29 7 Fr Cd	Var.
15	29 5 Cy Rn ☉	29 2 $\frac{1}{2}$ Rn St	28 19 Rn Cd	SE
16	29 1 Cy ☉ Rn	29 4 Rn ☉	29 9 Fr Cd	N
17	29 11 Cy Rn	29 12 Rn Cy	29 15 Fr Cd	NW
18	29 17 ☉	29 18 $\frac{1}{2}$ ☉ Cy	30 Fr Cd	WNW
19	29 19 Cy ☉	29 19 $\frac{1}{2}$ ☉ Wm Rn	30 Fr Cd	WNW
20	30 1 ☉	30 1 $\frac{1}{2}$ Cy Fr	30 Fr	W
21	29 19 Cy ☉	29 18 $\frac{1}{2}$ ☉	29 19 Cy Wd	W
22	29 19 Cy ☉	29 19 $\frac{1}{2}$ ☉	29 19 Fr	WSW
23	29 19 Cy ☉	29 18 ☉ Rn	29 17 Rn	WSW
24	29 18 ☉	29 19 ☉	29 19 Fr	W
25	29 18 ☉	29 16 $\frac{1}{2}$ ☉	29 14 Rn	SE
26	29 11 Rn Wd	29 12 Rn ☉	29 15 Fr	W
27	29 17 ☉	29 18 $\frac{1}{2}$ ☉ Cy	29 19 Rn	W
28	29 18 $\frac{1}{2}$ Cy ☉	29 18 Cy ☉	29 16 Fr	SE
29	29 13 ☉	29 14 ☉	29 14 Fr	W
30	29 12 ☉ Wd Rn	29 13 Rn Wd Cd	29 13 Fr Wd	SW
31	29 13 Cy ☉ Rn	29 15 ☉ Wm	29 17 $\frac{1}{2}$ Fr	WNW

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SEPTEMBER 1753.

D ^y	Morning.			Noon.			Night.			Wind.
1	29	16	Cy Rn Wd	29	15	Rn Cy Wm	29	16	Fr Wm	W
2	29	17	Fr ☉ Wd	29	17 $\frac{1}{2}$	☉ Cy	29	16	Fr Wm	SW
3	29	15	☉ Cy	29	15 $\frac{1}{2}$	Cy ☉	29	15	Cy Wd	WNW
4	29	14	Cy ☉	29	14 $\frac{1}{2}$	☉	29	17	Cy	W
5	29	17	☉	29	19 $\frac{1}{2}$	☉	30		Fr	W
6	29	19	Cy ☉	29	19	Cy	29	17 $\frac{1}{2}$	Cy Wd	W
7	29	17	Cy ☉	29	17	☉ Cy	29	18	Rn Cy	W
8	29	18 $\frac{1}{2}$	Cy Rn	29	18	Rn ☉	29	18	Cy	W
9	29	17 $\frac{1}{2}$	Cy Rn	29	18 $\frac{1}{2}$	Rn ☉	29	18	Cy	W
10	30		Cy ☉	30	1	☉ Wm	30	1	Fr Wm	Var.
11	30	1	Cy ☉	30	1 $\frac{1}{2}$	Cy Wm	30	3	Wm Fr	WNW
12	30	3	☉	30	3 $\frac{1}{2}$	☉ Cy Wm	30	3	Wm Fr	Var.
13	30	2	Cy ☉	30	1	☉ Ht	30		Wm Fr	E
14	29	18 $\frac{1}{2}$	☉	29	18 $\frac{1}{2}$	☉	29	18	Wm Fr	ESE
15	29	16	Cd ☉	29	15	☉	29	13	Cy +	ESE+
16	29	15	☉	29	17	☉ Wd	29	18	Fr +	W+
17	29	17	☉ Wd	29	16	☉ Wd	29	16	Cy Wd	SW
18	29	14 $\frac{1}{2}$	☉ Wd	29	15	☉ Wd	29	16	Cy Wm	WSW
19	29	15	Cy Wd	29	15	Cy Rn	29	15	Rn Wm	WSW
20	29	15	Fr ☉	29	15 $\frac{1}{2}$	☉ Wm	29	17 $\frac{1}{2}$	Fr Wm	Var.
21	29	18 $\frac{1}{2}$	☉ Cd	29	17	☉ Cd	29	17	Fr Cd	WNW
22	29	15	Cy ☉	29	15	☉ Cy	29	14 $\frac{1}{2}$	Cy Rn	Var.
23	29	14	Cy Wd ☉	29	14 $\frac{1}{2}$	☉ Wd	29	15	Cy Rn	W
24	29	15	☉	29	16 $\frac{1}{2}$	☉	29	17 $\frac{1}{2}$	Fr Cd	WNW
25	29	18	☉	29	18	☉	29	17	Cy	S
26	29	15	☉	29	13	☉	29	13	Cy	SSE
27	29	10 $\frac{1}{2}$	Rn	29	7 $\frac{1}{2}$	Rn	29	4 $\frac{1}{2}$	Cy Rn	SE
28	29	1 $\frac{1}{2}$	Cy ☉	29	2	☉	29	3	Cy	SW
29	29	6	☉ Wd Cd	29	8	☉	29	8	Cy	SW
30	29	2	Rn St ☉	29		Wd Rn ☉	29	5	Cd Wd Fr	SSW

Nota. Flashes of Fire at about 8 o'Clock at Night, at the N. N. E.
the 15th and 16th Instant.

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OCTOBER 1753,

D ^s	Morning.	Noon.	Night.	Wind.
1	29 6 $\frac{1}{2}$ Cy ☉	29 5 Cy Rn Cd	29 6 Fr Cd St	WSW
2	29 7 $\frac{1}{2}$ Fr ☉	29 9 ☉ Rn	29 11 Fr Wd Cd	WSW
3	29 10 Fr ☉	29 13 $\frac{1}{2}$ ☉	29 15 Fr Cd	W
4	29 14 $\frac{1}{2}$ Fr ☉	29 14 ☉	29 13 Rn Cy	SSW
5	29 13 Rn Cy	29 13 Rn	29 13 $\frac{1}{2}$ Cy	S
6	29 14 $\frac{1}{2}$ ☉	29 16 Cy	29 16 Fr	SW
7	29 15 Cy Rn	29 13 $\frac{1}{2}$ Cy	29 13 $\frac{1}{2}$ Lg Wm	SSE
8	29 12 $\frac{1}{2}$ ☉	29 10 $\frac{1}{2}$ Cy	29 9 $\frac{1}{2}$ Rn Wm	SSE
9	29 9 $\frac{1}{2}$ Rn ☉	29 10 ☉ Rn	29 10 Fr	NW
10	29 5 Fr ☉ Rn	29 2 Rn	28 19 $\frac{1}{2}$ Rn	SSE
11	28 18 Wd Rn	28 17 ☉	28 19 Lg St	SSE
12	28 19 $\frac{1}{2}$ Cy ☉	28 19 $\frac{1}{2}$ ☉	28 19 $\frac{1}{2}$ Wd Rn	SSE
13	29 4 ☉	29 8 ☉	29 8 Cd St	SSW
14	29 7 Cy	29 9 Rn	29 1 $\frac{1}{2}$ Cd	WSW.
15	29 13 $\frac{1}{2}$ ☉ Wd	29 11 $\frac{1}{2}$ Rn Wd	29 12 Rn Cd	SW
16	29 11 $\frac{1}{2}$ ☉ Wd Rn	29 10 Rn ☉	29 14 Cy Cd	W
17	29 18 $\frac{1}{2}$ ☉ Cy	29 19 $\frac{1}{2}$ Cy	29 16 $\frac{1}{2}$ Rn Wd	W
18	29 11 Wd Rn	29 11 Rn ☉	29 11 $\frac{1}{2}$ Rn	W
19	29 13 Cy	29 15 Cy ☉	29 16 $\frac{1}{2}$ Fr Cd	WNW
20	29 18 ☉ Cd	29 18 $\frac{1}{2}$ ☉ Cd	29 19 $\frac{1}{2}$ Fg Cd	W
21	30 ☉ Cd Fg	30 1 ☉	30 1 $\frac{1}{2}$ Fg Cd	E
22	30 3 Fg ☉	30 3 ☉	30 3 $\frac{1}{2}$ Fg Cd	Var.
23	30 3 $\frac{1}{2}$ Fg Cy	30 3 $\frac{1}{2}$ Cy Rn	30 3 $\frac{1}{2}$ Fg	W
24	30 3 $\frac{1}{2}$ Fg ☉	30 3 $\frac{1}{2}$ ☉	30 4 $\frac{1}{2}$ Fr	E
25	30 3 $\frac{1}{2}$ Fg Rn	30 3 $\frac{1}{2}$ Rn	30 4 Fr	E
26	30 2 $\frac{1}{2}$ Cy Rn ☉	30 2 Rn	30 2 Rn Cy	NE
27	30 3 Cy Rn	30 2 $\frac{1}{2}$ Rn	30 3 $\frac{1}{2}$ Fr	E
28	30 3 Cy	30 2 Cy	30 3 $\frac{1}{2}$ Cy	NW
29	29 17 Cy Cd	29 16 $\frac{1}{2}$ ☉ Cy Cd	29 17 $\frac{1}{2}$ Fr Cd	NW
30	29 18 ☉ Cd	29 18 ☉	29 14 Cy Cd	NW
31	29 13 $\frac{1}{2}$ ☉	29 13 $\frac{1}{2}$ ☉	29 14 Fg Cd	W

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NOVEMBER 1753.

D ^s	Morning.			Ncon.		Night.		Wind		
1	29	8	Rn	29	5 $\frac{1}{2}$	Rn	Cy	W		
2	29	8	☉	29	11 $\frac{1}{2}$	Fr	Fg	NNW		
3	29	13 $\frac{1}{2}$	Fg Fr ☉	29	14 $\frac{1}{2}$	Fr	Fr Wd	WSW		
4	29	16	Cy Rn	29	17	Rn Cy ☉	29	17	Fr Wd	WSW
5	29	16	Cy Rn	29	16	Rn HlWd	29	17	Fr Cd	WNW
6	29	16	Fr ☉ Cd	29	15	Cy Wd ☉	29	18	Fr Cd	NW
7	29	18	Fr Dk	29	18	Dk Cd	29	18	Dk Cd	N
8	29	18	Dk Cd	29	18	Dk Cd	29	18	Fg Rn	N
9	29	19	Fg ☉ Cd	29	18	Cy Cd	29	18	Fg Cd	N
10	29	15	Fg ☉ Cd	29	14	Fr ☉	29	9	Cy Cd	W
11	29	4	Rn ☉	29	3	☉ Cy Rn	29	2 $\frac{1}{2}$	Rn Cy	W
12	29	4	Fg Cy	29	5 $\frac{1}{2}$	Cy	29	9 $\frac{1}{2}$	Fg Ft	WNW
13	29	14 $\frac{1}{2}$	Fg ☉	29	15	Dk Ft	29	17 $\frac{1}{2}$	Fg Ft	WNW
14	29	15 $\frac{1}{2}$	Fg Wd	29	14 $\frac{1}{2}$	Cy	29	12 $\frac{1}{2}$	Rn CyWd	WSW
15	29	5	Cy St Rn	29	4	WdRn Hl	29	5	Cy Ft	W
16	29	5	Cy ☉ Cd	29	5	☉ CdWd	29	7	Fr Cd	W
17	29	6 $\frac{1}{2}$	Fg ☉ Cd	29	6	☉ Cd	29	5	FrFtFt	WSW
18	29	4	Fg Ft ☉	29	3 $\frac{1}{2}$	☉ Fg Ft	29	2	Fg Ft	W
19	29	4 $\frac{1}{2}$	Fg ☉	29	6 $\frac{1}{2}$	☉ St	29	10	Fg Ft	W
20	29	13 $\frac{1}{2}$	Fg ☉	29	14 $\frac{1}{2}$	☉	29	15	Fg Ft	W
21	29	13 $\frac{1}{2}$	Fg Rn	29	12	Rn	29	14 $\frac{1}{2}$	St Wm	W
22	29	13	Cy St	29	12 $\frac{1}{2}$	☉ Cy St	29	12 $\frac{1}{2}$	Cy Wd	S
23	29	13	Cy	29	12 $\frac{1}{2}$	Cy	29	13 $\frac{1}{2}$	Cy Fr	SW
24	29	17	Fr ☉	29	19	Fr ☉	30		Fr ☉	SW
25	29	13 $\frac{1}{2}$	Rn Wd	29	12 $\frac{1}{2}$	Rn	29	12	Rn St	SW
26	29	1	Rn	28	19	Rn	29		Rn St	W
27	29	9 $\frac{1}{2}$	St Fr	29	12	Fr Wd	29	13	Ft	WNW
28	29	15	Ft ☉	29	15	☉ Ft	29	17	Ft	WNW
29	29	18	Fg Ft	29	17	Fg Ft	29	16	Fg Ft	WNW
30	29	14 $\frac{1}{2}$	Fg Ft	29	15 $\frac{1}{2}$	Fg Thg	29	17 $\frac{1}{2}$	Rn	Var.

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DECEMBER 1753.

D.		Morning.	Neon.	Night.	Wind.
1	30	Fg Fr Cd	30 1½ Cd Fr	30 2½ Fg Cd	NW
2	30	4 Fg Dk Cd	30 3½ Dk Cd	30 3½ Dk Cd	NNE
3	30	2½ Dk Cd	30 2½ Dk Cd	30 2 Fg Ft	E
4	30	1 Fg Ft	30 Ft	29 18½ Fg	W
5	29	15 Cy Rn	29 13½ Rn	29 14 Rn	Var.
6	29	14 Sw Cd	29 14½ Sw Cd	29 15 Fr Ft	NNW
7	29	17 Fr Ft	29 19 Ft Fr	29 19½ Ft Fr	WNW
8	30	2 Ft	30 1½ Ft Dk	30 1 Ft	W
9	30	Ft	30 Ft	29 18½ Ft	Var.
10	29	15 Thg Rn	29 12 Rn	29 8 Rn	SE
11	29	7 Rn	29 6 Rn	29 4 Rn	E
12	29	1 Rn	28 19 Rn	28 16 Rn St	Var.
13	28	19 Rn St	28 12 Cy Wd	29 5½ Fr	WSW
14	29	5 Rn	29 3½ Cy Wd	29 4 Wd Rn	Var.
15	29	10 Cy Fr	29 11 Cy Fr	29 10½ Cy Rn	SE
16	29	8 Rn	29 7½ Cy	29 8 Rn	WSW
17	29	4½ Rn	29 1½ Rn	29 4 Cy	Var.
18	29	6 Cy ☉	29 7 Cy ☉	29 9 Cy Rn	W
19	29	7 Rn	29 6 Rn	29 5 Rn	W
20	29	7 Cy	29 8 Fr ☉	29 8 Fr	WSW
21	29	10 Cy ☉	29 10 ☉ Cy Rn	29 10 Cy St	WSW
22	29	10½ Cy Rn	29 10 ☉ Rn	29 10 Cy Wd	WSW
23	29	13 Cy Rn	29 13 Rn	29 10 Fr	WSW
24	29	4 Cy ☉	29 6 Rn Wd	29 13½ Fr	W
25	29	1½ Rn	29 8½ Rn	29 7 Rn	WSW
26	29	3 Rn Wd	29 5 Fr Wd	29 7 Rn Wd	WSW
27	29	9 Fr ☉ Cd	29 12½ Hl Sw	29 11 Fr	WNW
28	29	17½ Ft ☉	30 ☉ Ft	30 2 Ft	NNE
29	30	4½ Ft ☉	30 3½ ☉ Ft	30 3 Ft	NNW
30	30	½ Ft Fg ☉	30 ☉ Ft	29 19½ Cd	SW
31	30	Cy	29 19½ Cy	29 19 Fg Wd	WSW

The Barometer made use of for these observations has a tube $\frac{1}{4}$ of an inch diameter, and holds 2lb of quick-silver.

The height of the quicksilver I generally take about 7 o'clock in the morning, 2 in the afternoon, and 9 at night ; and the different changes in the weather as they happened in the day.

I have divided the scale of my barometer in inches, from 28 to 31, and each into 20 parts, so that when you find in this journal 29 $1\frac{1}{2}$, it is 29 inches $\frac{3}{40}$ parts of an inch.

Explanation of the Marks.

Cd Cold.	Hl Hail.	St Storm.
Cy Cloudy.	Ht Heat.	Sw Snow
Dk Dark.	Lg Lightning.	Thd Thunder.
Fr Fair.	☉ Sunshine.	Thg Thawing.
Fg Fog.	Rn Rain.	Wd or Wy Wind.
Fr Frost.	Sl Sleet.	Wm Warm.

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J A N U A R Y 1754.

D ^y	Morning.		Noon.		Night.		Wind.	
1	29	15	Cy	29 17 ¹ ₂	Cy	29 19	Cd	WSW
2	30		Cy	29 15	Cy	29 16	Cy	WSW
3	29	17 ¹ ₂	Fg ☉	29 16	Rn	29 16 ¹	Rn Cy	W
4	29	15 ¹ ₂	Cy ☉ Wd	29 10	☉ Cy Wd	29 6	Cy St	WSW
5	29	2	Cy Wd	29 2	Cy St	29 5	Cy	WSW
6	29	2	Rn Sw	29 1 ¹ ₂	Cy Rn	29 1	Fr	W
7	29	6	Fr ☉	29 5	☉ Cy	29 1	Cy Cd	W
8	29	1 ¹ ₂	Cy ☉	29 2	Fr ☉	29 5	Fg	ENE
9	29	11 ¹ ₂	Fg Cy	29 10 ¹ ₂	Cy	29 10	Fr Wd	WSW
10	29		Wd Rn	28 16	Rn St	28 16 ¹ ₂	Rn St	SSW
11	29	1	Fr	29 4 ¹ ₂	Fr	29 7	Ft	WSW
12	29	2	Cy	28 17 ¹ ₂	Rn	28 17 ¹ ₂	Cy	S
13	28	16 ¹ ₂	Cy Rn	28 15	Rn	28 12 ¹ ₂	Rn St	SW
14	28	11	Cy ☉	28 12	Fr	28 12	Rn	W
15	28	16	Cy ☉	28 17	☉	28 15	Rn	Var.
16	28	19	Cy ☉	29 4	☉	29 6 ¹ ₂	Fr	Var.
17	29	3 ¹ ₂	Cy	29 2 ¹ ₂	Cy	29 3 ¹ ₂	Rn	WSW
18	29	10	Fr	29 13 ¹ ₂	Fr ☉	29 17 ¹ ₂	Fr Cd	WSW
19	30		Fg	30 2	Rn	30 4 ¹ ₂	Cy Wm	W
20	30	5	Cy Rn	30 5	Cy Rn	30 4 ¹ ₂	Cy Wm	W
21	30	3 ¹ ₂	Cy Rn	30 5 ¹ ₂	Rn Cy	30 6	Cy Wm	WSW
22	30	6 ¹ ₂	Cy ☉	30 7	☉	30 5	Fg	WSW
23	29	18 ¹ ₂	Cy	29 18	Cy	29 17 ¹ ₂	Cy	W
24	29	9	Cy Rn	29 5	Rn	29 7	Fg Ft	WNW
25	29	8	☉ Ft	29 7 ¹ ₂	☉ Ft	29 7	Fg Ft	WNW
26	29	8	Ft ☉	29 9 ¹ ₂	Sleet	29 11	Fg Ft	WNW
27	29	12	Ft ☉	29 12	St ☉	29 14	Ft	NW
28	29	15	Ft ☉	29 15 ¹ ₂	☉ Ft	29 18	Ft	NW
29	29	19 ¹ ₂	Ft ☉	29 19 ¹ ₂	Ft ☉	30	Ft Sw	NW
30	30	1	Sw Ft	30 1 ¹ ₂	Thg	30 2	Thg	WNW
31	30	3	☉ Cd	30 3	☉ Cd	30 3	Fr Cd	WNW

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F E B R U A R Y 1754.

D ^{ys}	Morning.		Noon.		Night.		Wind.
1	30	2	○ Rn	30 $\frac{1}{2}$ Cy Rn	29 17 $\frac{1}{2}$ Cy	Wd Ft	WNW
2	29	15	St ○ Sw	29 14 $\frac{1}{2}$ ○ Cy Sw	29 14 $\frac{1}{2}$ Wd Ft		NW
3	29	15	Ft ○	29 15 ○ Ft	29 15 Ft		NW
4	29	11 $\frac{1}{2}$	Fg Cy	29 8 $\frac{1}{2}$ Rn	29 4 Rn		NW
5	29	11 $\frac{1}{2}$	Cy Rn	29 1 $\frac{1}{2}$ Rn Sw	29 2 Fr		SE
6	29	3	Cy Rn	29 4 Rn Sw	29 4 Rn		SE
7	29	8	Cy	29 10 Cy Fr	29 12 Fr Cd		SE
8	29	13	Ft ○	29 12 Rn Sw ○	29 9 $\frac{1}{2}$ Rn		SE
9	29	9 $\frac{1}{2}$	Fr ○	29 11 ○	29 12 Fr		SE
10	29	3	Rn Wd	29 6 Rn ○ Wd	29 5 Cy Rn Wd		WSW
11	29	9	Cy Rn	29 9 Rn	29 8 $\frac{1}{2}$ Rn St		WSW
12	29	9	Rn St	29 8 Rn St	29 7 $\frac{1}{2}$ Rn St		WNW
13	29	5	Cy Rn	29 5 Rn ○	29 11 Fr		WNW
14	29	19	Fr Cy	29 16 $\frac{1}{2}$ Cy	29 15 Cy		WSW
15	29	13	Fr ○	29 14 ○ Cy	29 16 Cd		W
16	29	18	Fr ○	29 18 $\frac{1}{2}$ ○	29 16 Cy		W
17	29	16	Cy Wd Rn	29 19 Fr	30 Fr		W
18	30	7	○	30 7 ○	30 7 Fr		NE
19	30	5	Fg ○	30 3 Dk	30 Cy		NE
20	29	16	Cy ○	29 15 ○	29 14 Fr		SW
21	29	15 $\frac{1}{2}$	○	29 19 $\frac{1}{2}$ ○	30 2 Fr		SW
22	30	1	○	29 18 ○	29 17 Fr		W
23	29	16 $\frac{1}{2}$	○ Hl Rn	29 18 $\frac{1}{2}$ ○ Hl Rn	29 18 $\frac{1}{2}$ Fr		W
24	30	2 $\frac{1}{2}$	○ Cd	30 2 ○	30 1 $\frac{1}{2}$ Fg		W
25	29	15	Cy Wd Hl	29 16 Cy Wd Rn	29 17 Cy		W
26	29	18	○	29 19 ○	30 1 Fr		WNW
27	30	2	Cy ○ Wm	30 1 ○ Wm	30 1 Fr		Var.
28	29	19 $\frac{1}{2}$	○	29 19 $\frac{1}{2}$ ○	29 19 Fr		W

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D ^y	Morning.	Noon.	Night.	Wind.
1	29 18 ☉	29 17½ ☉	29 16½ Fg	SE
2	29 16½ Cy Rn ☉	29 18 ☉	29 19 Fg	W
3	30 1 Fg ☉ Rn	30 ½ Cy ☉ Rn	30 2 Cy	Var.
4	30 2 Fg ☉	30 2 ☉	30 2½ Fg	Var.
5	30 3 Cy	30 3 Cy	30 3 Cy	Var.
6	30 6 Ft	30 7 ☉ Cd	30 7½ Fg Ft	SE
7	30 7½ ☉ Fg ☉	30 6 ☉	30 4½ Fr	NW
8	30 1½ Cy ☉	30 1 ☉	29 19½ Fg	WNW
9	29 17½ Cy Rn	29 17½ Rn Cy	29 17½ Cy	ENE
10	29 18 Cy Cd ☉	29 19 ☉ Cd	30 ½ Cd	ENE
11	30 2 Cy Hl Sw	30 3 Cy Cd	30 4 Cy Hl Cd	ENE
12	30 4 ☉ Hl	29 3½ ☉	30 2 Cy Sw	ENE
13	29 16 Sw Rn	29 10 Rn	29 9 Wd Ft	WNW
14	29 9 Wd ☉	29 10 St	29 11 Cd Ft	NNW
15	29 12 ☉ Sw Wd	29 12½ Wd Sw ☉	29 14 Ft	NNW
16	29 14 Dk	29 14½ Dk	29 14½ Fg Ft	NNW
17	29 14 ☉ Sw	29 12½ Dk Sw ☉	29 13 Cd	NNW
18	29 11 ☉ Sw	29 10 Sleet ☉	29 9½ Wd	SE
19	29 12 Cy ☉	29 13 ☉	29 12½ Cd Dk St	SE
20	29 5 Rn	29 7½ Rn	29 9 Cy	Var.
21	29 12 ☉ Rn	29 15 ☉ Rn	29 19½ Dk	W
22	30 1½ ☉ Wm	30 2½ ☉ Cy	30 4 Dk	WNW
23	30 3½ Dk ☉	30 3 ☉	30 4 Rn Cy	WNW
24	30 3½ Dk Slt	30 3 Slt Sw	30 2 Rn Cy	E
25	30 1 Rn Cy	30 Rn	29 19½ Rn Cy	ENE
26	29 18 Cy Rn	29 19 Cy	29 19 Cy Cd	E
27	30 Cy ☉	30 2 Cy ☉	30 3 Cy Cd	E
28	30 3½ ☉ Cd	30 4 ☉ Cd	30 4 Fr Cd	ENE
29	30 2 ☉	30 2 ☉	30 Cy Cd Sw	NE
30	29 18 Sw ☉	29 18 ☉	29 15½ Fg	NE
31	29 7½ Cy Rn	29 5 Rn Wd	28 19 Rn Wd	WSW

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D ^s	Morning.		Noon.		Night.		Wind.
1	28 17	Cy ☉ Wd	29	Cy ☉ Cd	29 3	Fr St Wd	WNW
2	29 5 $\frac{1}{2}$	☉ Sw	29 7	☉ Hl	29 9 $\frac{1}{2}$	Fg	W
3	29 8 $\frac{1}{2}$	Cy Rn ☉	29 8	☉ Cy	29 7 $\frac{1}{2}$	St	SE
4	29 4 $\frac{1}{2}$	☉ Rn	29 4 $\frac{1}{2}$	☉ Rn Wd	29 7 $\frac{1}{2}$	Cy	Var.
5	29 8 $\frac{1}{2}$	Rn	29 6 $\frac{1}{2}$	Rn	29 6	Rn Cy Wd	SE
6	29 8	Cy Rn ☉	29 9	Rn ☉	29 11 $\frac{1}{2}$	Cy Fg	E
7	29 13	☉	29 13	☉	29 12	Fr	S
8	29 13	Cy Rn Hl	29 14	Rn Hl	29 16	Fr	SSE
9	29 17 $\frac{1}{2}$	Fr ☉	29 18	☉	29 18 $\frac{1}{2}$	Fg	E
10	29 18	☉	29 18	☉	29 17 $\frac{1}{2}$	Cy	E
11	29 17 $\frac{1}{2}$	Cy Rn	29 19	Rn Cy	30 1	Fg	W
12	30 2 $\frac{1}{2}$	☉	30 3	☉	30 3	Fr	Var.
13	30 1 $\frac{1}{2}$	Cy ☉ Wm	30 1	☉ Wm	30 1	Fg	NNW
14	29 18	Cy Wd	29 14	Cy Wd Rn	29 12	St Rn	W
15	29 14	☉ Rn Hl	29 14	☉ Hl Wd	29 14	Cy	WNW
16	29 14	☉ Hl Rn	29 14	Hl ☉ Rn	29 14 $\frac{1}{2}$	Cy	Var.
17	29 10	Cy Rn	29 7	Rn	29 7	Cy	W
18	29 7	☉ Cy Sw	29 8	Hl ☉ Cd	29 9 $\frac{1}{2}$	Fg Ft	WNW
19	29 10	Cy ☉ Hl	29 10 $\frac{1}{2}$	Hl Sw ☉	29 12	Fg	NNW
20	29 6	Rn Sw	29 4 $\frac{1}{2}$	Rn Sw	29 7	Rn Wd	SE
21	29 14	☉	29 14 $\frac{1}{2}$	☉	29 16	Fr	NW
22	29 18	☉	30	☉	30	Fr	Var.
23	29 19 $\frac{1}{2}$	☉	29 19 $\frac{1}{2}$	☉	30	Fg	Var.
24	29 17	Cy Rn	29 17	Rn	29 15	Rn	WNW
25	29 15 $\frac{1}{2}$	Cy Rn	29 15	☉ Rn	29 15	Fr Rn	WNW
26	29 14	Cy Rn	29 14	☉ Rn	29 14	Rn Wm	W
27	29 14 $\frac{1}{2}$	Cy Rn	29 14 $\frac{1}{2}$	Cy Rn	29 14 $\frac{1}{2}$	Rn Wm	ESE
28	29 15	Cy Rn	29 15	Rn	29 16	Rn Wm	ESE
29	29 17	Cy ☉	29 18	☉	29 18	Fr Cd	ESE
30	29 17	Cy ☉	29 17	☉	29 18	Fr Cd	E

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D ^y	Morning.		Noon.		Night.		Wind.
1	30	Fr ☉	30 1	Fr Cy	30 2	Fr	Var.
2	30 1	☉ Wm	30 1½	☉ Wm	30 1	Fr Cy	Var.
3	29 18	Cy ☉	29 15	Cy ☉	29 14	Rn Cy	S
4	29 12	Rn	29 10	Cy Rn	29 9½	Cy Cd	NW
5	29 5	Rn Wd	29 3	Rn Wd	29 5	Cy Cd	SE
6	29 8	☉	29 9	☉	29 9½	Fr	Var.
7	29 9	☉	29 9	☉	29 9	Rn	ESE
8	29 9	Cy ☉	29 9	☉	29 10	Fr	E
9	29 9	☉	29 11	☉	29 13	Fr	E
10	29 14	Fr ☉	29 15	☉	29 15	Fr	Var.
11	29 15	Cy	29 15	☉ Cy	29 15	Rn	Var.
12	29 13	Cy Rn	29 12	☉	29 12	Rn	SW
13	29 11	Cy Rn	29 10	Rn	29 9	Rn Wd	SSE
14	29 10½	Fr ☉	29 12	☉	29 15	Fr	W
15	29 15	Fr ☉	29 15	☉	29 15	Fr	SW
16	29 14	Cy Rn ☉	29 12	☉ Rn	29 10	Rn	Var.
17	29 6	☉ Wd Rn	29 7	Wd Rn ☉	29 10	Fr Cd	W
18	29 10	Cy Rn	29 10	Cy Wd	29 10	Cy Wd Cd	S
19	29 12½	Fr ☉	29 14	Cy ☉	29 16	Fr	S
20	29 15	☉	29 15	☉	29 14	Fr	E
21	29 14	☉	29 13	☉	29 13	Fr	E
22	29 13	☉	29 12½	Cy	29 11	Cy Rn	ENE
23	29 7	Rn	29 6	Rn	29 6	Rn	E
24	29 7	Cy Rn	29 7	Rn	29 8½	Rn	E
25	29 11	Cy ☉	29 12	☉	29 13	Fr	Var.
26	29 14	Fr ☉	29 16	☉	29 17	Fr Cd	ENE
27	29 18	Cy ☉	29 19½	☉	29 19½	Fr	E
28	29 19	☉ Wm	29 19½	☉ Wm	29 19	Fr Wm	ENE
29	29 18	☉	29 17	☉	29 15	Cy	ESE
30	29 13	Cy ☉	29 12	Cy ☉	29 10	Cy	S
31	29 9½	☉ Rn	29 11½	☉ Rn	29 11½	Cy Rn	SE

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D ^y	Morning.	Noon.	Night.	Wind.
1	29 7½ Cy Rn Wd	29 6 Wd ☉ Rn	29 9 Fr	SSE
2	29 8 Cy Wd Rn	29 6½ Rn Wd ☉	29 7 Cy	S
3	29 6½ Rn ☉ Wd	29 6 Rn ☉	29 7 Cy	SSE
4	29 9 Cy Rn ☉	29 9 Rn ☉	29 11½ Cy	Var.
5	29 12 Cy ☉ Rn	29 13 ☉ Rn	29 13 Cy	E
6	29 13½ Cy Rn	29 14 Rn	29 15 Rn	NNW
7	29 16 Cy ☉	29 16 Cy ☉	29 15 Fr	NNW
8	29 13 Cy	29 13½ Cy Rn	29 14 Rn Cy	WNW
9	29 14 Cy Rn	29 12 Cy Rn Wd	29 7 Rn St	WNW
10	29 9 St ☉ Rn	29 11 ☉ Wd	29 13 Fr	WNW
11	29 12 Rn ☉	29 14 ☉ Rn	29 15 Cy Rn	W
12	29 16 Rn ☉	29 17 Cy ☉	29 17 Cy	WSW
13	29 16½ Cy	29 15 Rn Cy	29 14 Rn Cy	Var.
14	29 12 Rn	29 10 Rn	29 9 Cy Wd	NE
15	29 9½ Rn	29 11 ☉ Cy	29 12 Fr	E
16	29 12 ☉	29 13 ☉	29 13 Fr Wm	E
17	29 13 Fr ☉	29 13 ☉	29 13½ Fr Wm	Var.
18	29 13 Fr ☉ Rn	29 15 Cy ☉	29 17½ Wd Fr	WNW
19	29 19½ Fr ☉	30 1 Dk ☉	30 2 Fr	WNW
20	30 1 ☉	30 ☉	29 18 Cy	SE
21	29 16 Cy Rn	29 14½ Rn Cy	29 14 Rn Cy	Var.
22	29 15 Cy ☉	29 15½ Cy ☉ Rn	29 16 Fr Cy	Var.
23	29 16 ☉	29 17 Rn ☉	29 16 Cy Rn	WSW
24	29 12 Rn	29 10 Rn	29 9 Rn Cy	ESE
25	29 8 Cy Rn	29 8 Rn ☉	29 9 Cy	W
26	29 8½ ☉ Rn	29 10 Cy ☉	29 12 Fr	WNW
27	29 14 Cy ☉ Rn	29 12 Rn ☉	29 13½ Fr	NW
28	29 12 ☉ Rn	29 9 Rn Wd	29 7 Wd Cd	W
29	29 12 Cy	29 13 ☉	29 12 Rn Cd Wd	SE
30	29 12 Cy Wd Rn	29 12 ☉ Rn Wd	29 13 Cy Wd Cd	W

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J U L Y 1754.

D	Morning.		Noon.		Night.		Wind.
1	29 15	Cy ☉ Rn	29 16	☉ Ht	29 18	Fr Wm	WNW
2	29 18	☉	29 18	☉ Rn	29 16	Rn	WSW
3	29 13½	Cy Rn	29 14	Cy	29 14½	Cy Wm	WNW
4	29 15	Fr ☉	29 15½	☉ Ht	29 15	Ht Fr	W
5	29 14	Fr ☉	29 14	☉ Cy	29 13	Rn Cy	W
6	29 14	Fr ☉ Cy	29 14	Rn Cy ☉	29 14	Cy Wd	W
7	29 14	Rn	29 14	Rn	29 14	Rn Wd	W
8	29 15	Cy Rn	29 16	☉ Cy	29 16	Cy	WNW
9	29 15	Cy Rn ☉	29 14½	Cy ☉ Rn	29 14	Cy	NW
10	29 15	☉	29 16	☉	29 16	Cy	NNE
11	29 15	Cy ☉	29 12	Cy Rn	29 9½	Rn Cy	SW
12	29 11½	Rn Cy	29 13½	☉	29 14	Fr Wm	WNW
13	29 12	Dk ☉	29 11½	☉	29 15	Fr	W
14	29 10	☉ Rn	29 11	Rn	29 12	Rn Cy	W
15	29 12	Cy Rn	29 12	Hl	29 12	Cy Cd	Var.
16	29 10	☉ Rn Hl	29 8½	Rn ☉	29 7	Cy Cd	SE
17	29 7½	Cy Rn ☉	29 10	☉ Rn Cy	29 12	Cy Cd	NW
18	29 13	☉ Cd	29 13	☉ Cd	29 14½	Fr Cd	SSE
19	29 14½	Cy Rn ☉	29 16	☉ Rn	29 17	Fr Cd	SE
20	29 18½	☉	29 18	Rn	29 16	Cy Wd Cd	SW
21	29 15	Cy Rn	29 13	Rn Cd	29 10	Rn Wd Cd	ESE
22	29 8½	☉ Rn	29 8	☉ Rn	29 9½	Rn Cd	WSW
23	29 10	☉ Cy Rn	29 12	☉ Cy	29 13	Fr	W
24	29 7	St Rn	29 3	Rn Wd	29 2½	Rn Wd	SSE
25	29 8	Cy ☉	29 11½	☉ Wm	29 11	Wd Fr	Var.
26	29 12	Rn	29 13	Cy ☉	29 13	Fr	SW
27	29 14	☉	29 15	☉ Rn	29 16½	Rn	WSW
28	29 17½	Fr ☉	29 18	☉ Rn Hl	29 19½	Fr	WSW
29	30	☉	30 ½	Cy ☉ Rn	30 1	Rn	SE
30	29 18½	Cy Rn	29 17½	Cy	29 16½	Cy Wd Cd	SSE
31	29 14½	Cy Rn	29 14½	Cy Rn	29 14½	Cy Cd	SW

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A U G U S T 1754.

D ^s	Morning.			Noon.		Night.		Wind.
1	29 13 $\frac{1}{2}$	Cy Rn	☉	29 13 $\frac{1}{2}$	Cy Rn	29 14	Cy Cd	WNW
2	29 13 $\frac{1}{2}$	Cy Rn		29 13 $\frac{1}{2}$	Cy Rn	29 14	Cy	Var.
3	29 14	☉		29 13 $\frac{1}{2}$	☉	29 12	Cy	SSE
4	29 9	Cy ☉		29 10	☉	29 12	Fr	WNW
5	29 10			29 10	☉	29 11	Fr	SSE
6	29 10	Fr Cy		29 9	Cy Rn	29 6	Rn	Var.
7	29 6	☉		29 8	☉	29 7	Cy Rn	Var.
8	29 4 $\frac{1}{2}$	Rn ☉ Wd		29 7	☉ Wd Rn	29 10	Cy	WSW
9	29 12	☉		29 15	☉	29 17	Fr	W
10	29 17 $\frac{1}{2}$	☉		29 18 $\frac{1}{2}$	☉	29 19 $\frac{1}{2}$	Fr	Var.
11	29 18 $\frac{1}{2}$	Fr ☉		29 18	☉	29 15	Cy	Var.
12	29 15	☉		29 16	☉	29 16	Fr	Var.
13	29 15	Cy		29 14 $\frac{1}{2}$	Cy	29 14	Cy	Var.
14	29 13	Cy ☉		29 13	☉ Rn	29 12	Cy Wd	Var.
15	29 11 $\frac{1}{2}$	Rn		29 14	☉	29 16 $\frac{1}{2}$	Fr	WNW
16	29 17 $\frac{1}{2}$	☉		29 19 $\frac{1}{2}$	☉ Ht	30 $\frac{1}{2}$	Fr	SE
17	30	☉		30 $\frac{1}{2}$	☉ Ht	30	Fr	ESE
18	29 18 $\frac{1}{2}$	Fr ☉		29 18	☉	29 17 $\frac{1}{2}$	Fr	E
19	29 17	☉ Rn		29 16 $\frac{1}{2}$	Rn Cy	29 15	Fr	NE
20	29 14 $\frac{1}{2}$	☉ Ht		29 14	☉ Ht	29 13 $\frac{1}{2}$	Fr	E
21	29 13	☉ Ht		29 13	☉ Ht	29 12 $\frac{1}{2}$	Cy Fr	E
22	29 12	Cy ☉		29 12	☉ Ht	29 12	Cy Fr	W
23	29 11 $\frac{1}{2}$	☉ Ht		29 11 $\frac{1}{2}$	☉ Ht	29 11 $\frac{1}{2}$	Fr	W
24	29 10	Cy		29 9 $\frac{1}{2}$	Cy	29 9 $\frac{1}{2}$	Cy	NE
25	29 11	Cy ☉		29 12 $\frac{1}{2}$	☉	29 16 $\frac{1}{2}$	Fr	E
26	29 17 $\frac{1}{2}$	☉		29 18	☉ Wd	29 18 $\frac{1}{2}$	Cy Cd	W
27	29 16	Cy ☉ Wd		29 14	☉ Rn Cd	29 16	Cy	W
28	29 18	☉		29 19	☉	30 1	Fr Cd	SSW
29	30 1	☉ Cd		30	Cy Rn	29 19	Rn Cy	SSW
30	30	☉		30 1	Cy ☉	30 3	Fr	NW

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S E P T E M B E R 1754

Day	Morning.			Noon.			Night.			Wind.
1	30	2	☉	30	2½	☉ Ht	29	2	Hr	Var.
2	30	2	☉	30	2	☉	30	3	Fr.	E
3	30	3½	☉	30	4	☉ Ht	30	3½	Fr	E
4	30	3	☉	30	2½	☉	30	2	Rr	NE
5	30	1	☉	30	1	☉	30	2½	Fr	WNW
6	30	1	☉	30		Cy. ☉	30		Cy	W
7	29	18	Cy Rn	29	16½	Cy Rn	29	14	Cy Rn	WSW
8	29	14	Cy Rn	29	15½	☉	29	17½	Fr	WNW
9	29	16	Cy ☉	29	15	Rn Cy	29	14½	Fr	WSW
10	29	13	Cy ☉	29	12	☉	29	12	Cy	WSW
11	29	11	Rn	29	12½	Rn ☉	29	11½	Fr	WNW
12	29	18½	☉	30		☉	30	2	Fr	W
13	30	2	Fr ☉	30	2½	☉	30	3	Fr	WSW
14	30	3½	Fr ☉	30	4	☉	30	5	Rr	WSE
15	30	5½	☉	30	6	☉	30	7	Fg	E
16	30	7½	☉	30	7½	☉	30	7	Fg	E
17	30	6½	☉	30	6	☉	30	5	Fg	E
18	30	4½	☉	30	6	☉	30	5	Fr Wm	E
19	30	4	Fg ☉	30	3½	☉	30	3	Cy Cd	E
20	30	2	Cy ☉	30	2	Cy ☉	30	1	Fr	E
21	30		☉ Cy	30		Cy	30	1½	Fr	ESE
22	30	1½	☉	30	1½	☉	30	1½	Fr	E
23	30	1	☉	30		☉	29	18½	Fr	ESE
24	29	17½	☉	29	17	☉	29	16	Fr Cy	ESE
25	29	15½	Rn ☉	29	16	☉	29	15½	Cy	ESE
26	29	15	☉	29	13½	Cy	29	9½	Rn	SW
27	29	14½	☉	29	17	☉	30		Fr	Var.
28	30	1	☉	30	1	☉	30	1	Fr	E
29	29	19½	☉	29	19½	☉	30		Fr	ESE
30	29	19½	☉	29	19	☉	29	19	Fg Fr	SE

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OCTOBER 1754.

D ^s	Morning.	Noon.	Night.	Wind.
1	29 18 ¹ / ₂ ☉	29 17 ☉	27 17 Rn	SE
2	30 1 ¹ / ₂ ☉	30 3 ☉	30 6 Fr Cd	WNW
3	30 5 ☉	30 5 ☉	30 5 Fr	W
4	30 2 ¹ / ₂ Dk ☉	30 1 Cy	29 19 Cy Cd	Var.
5	29 13 Cy ☉	29 11 Cy Rn	29 11 Rn	W
6	29 8 ¹ / ₂ ☉	29 6 ☉ Rn	29 7 Cy Cd	W
7	29 7 ☉ Cd Rn	29 9 Rn ☉	29 11 Fr	WNW
8	29 10 ☉	29 7 ☉ Rn	28 18 St Rn	S
9	28 14 ¹ / ₂ ☉	28 12 ¹ / ₂ ☉	28 9 ¹ / ₂ Wd St	SE
10	28 9 Rn Wd	28 16 Rn Wd ☉	28 17 Wd St	WSW
11	29 3 ☉ Wd	29 4 ☉ Rn	28 19 ¹ / ₂ Rn	WSW
12	29 3 ¹ / ₂ ☉	29 7 ☉ Rn	29 7 Rn Cy	W
13	29 10 ☉	29 12 ¹ / ₂ ☉	29 16 Fr	W
14	29 17 ¹ / ₂ ☉	29 17 ☉	29 18 Fr	S
15	29 15 ¹ / ₂ Cy ☉	29 14 ¹ / ₂ Cy	29 11 Cy Rn St	SE
16	29 5 Cy ☉	29 8 Rn Cy ☉	29 4 Rn St	SSW
17	29 9 ¹ / ₂ Cy ☉	29 13 ☉	29 15 Fr	WSW
18	29 17 ☉ Wm	29 18 ☉ Wm	29 17 ¹ / ₂ Fr	S
19	29 17 ☉ Wm	29 17 ☉ Wm	29 19 Fr	ESE
20	29 19 ¹ / ₂ ☉ Ht	29 19 ☉ Ht	29 19 Fr	Var.
21	29 18 ¹ / ₂ ☉ Ht	29 18 ☉ Ht	29 18 Fr	E
22	29 16 ¹ / ₂ Rn ☉	29 16 ☉	29 17 Fr	WNW
23	29 17 ☉	29 16 ☉ Cy	29 14 ¹ / ₂ Rn Wd	WSW
24	29 13 ¹ / ₂ Cy Wd	29 12 Cy Wd	29 12 Cy Wd	W
25	29 10 Rn	29 7 ¹ / ₂ Rn	29 4 ¹ / ₂ Cy Rn	WSW
26	29 2 Rn	29 Rn	28 18 Rn	WNW
27	28 17 Cy Cd Wd	28 17 ¹ / ₂ Cy Cd Wd	28 18 Cy Wd	NW
28	28 19 ☉ Cd	29 ☉ Cy Cd	29 2 ¹ / ₂ Fr Cd	Var.
29	29 4 ¹ / ₂ ☉ Cd	29 5 ☉ Cd	29 6 Fg Cd	WNW
30	29 2 ¹ / ₂ ☉ Cy	29 1 Cy Rn Wd	29 Rn Wd	SE
31	29 7 Cy	29 11 Cy	29 14 Fr	WNW

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N O V E M B E R 1754.

D ^s	Morning.		Noon.		Night.		Wind.
1	29 16	Dk ☉	29 18	☉	30 1½	Fr Fg	WNW
2	30 2	Fg ☉	30 2	☉	30	Fr Fg	WNW
3	30	Cy Rn Cd	30	Cy	30 3	Fr Fg	WNW
4	30 3½	☉	30 3½	☉	30 1	Fg Cd	WNW
5	29 16	☉ Rn	29 14	Cy Rn	29 14½	Fr	WNW
6	29 18	☉	29 8	Cy	29 6	Cy Wd Rn	W
7	28 14	Rn ☉	28 13	☉	28 12½	Cy Rn	Var.
8	28 9½	Rn ☉	28 12	☉	28 15	Fr	S
9	28 17½	Fr ☉	28 19	☉	28 17	Fr Cy	Var.
10	28 12	Rn	28 13	Cy Rn	28 17	Cy	Var.
11	28 16	Fg ☉	28 16½	☉	28 17	Fg	Var.
12	28 17	Fg ☉	28 18	☉	28 19½	Fg	W
13	29 4	Fg ☉	29 7½	☉	29 10	Fg	NW
14	29 12½	Fg ☉	29 12	☉	29 10	Fr	S
15	29 8	Cy	29 7	Rn St	29 10	Rn	SE
16	29 12	Fg ☉	29 15	Fr	29 15	Fg	SE
17	29 17½	Fg ☉	29 18	☉ Cy	30	Fg	SE
18	29 19	Cy ☉	29 19	Cy ☉	30	Fg	ENE
19	29 19½	Fg ☉	29 19½	☉	30	Fr	SE
20	29 19½	☉	29 19	☉ Cy	29 18½	Fr	SE
21	29 17½	Cy ☉	29 16½	☉ Cy	29 15	Wd	SSE
22	29 12½	Cy	29 16	☉ Cy	29 18	Fr	SSE
23	29 2	Cy Rn	29 2	☉ Cy	28 19	Cy	Var.
24	28 14½	Cy	28 16	Rn	29 2	Cy	W
25	29 4	Fg ☉	29 4½	☉ Cd	29 7	Fr Ft	WNW
26	29 8	Fg ☉	29 8	☉ Cd	29 9	Fg Ft	WNW
27	29 10½	Fg Ft ☉	29 11½	Dk Ft	29 14	Fg Ft	NW
28	29 17	Fg ☉	29 19	Dk Ft	30 1	Fg Ft	WNW
29	30 2	Fg Ft	30 2	Dk Ft	30 2	Fg Ft	WNW
30	30	Fg Dk	29 19	Dk Fg Thg	29 17½	Fg	W

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D E C E M B E R 1754.

D ^y	Morning.		Noon.		Night.		Wind.
1	29 15	Fg Cy Rn	29 16	Cy	29 14 ¹	Cy Rn	Var.
2	29 9	Fg Rn	29 5 ¹	Cy Rn	29 5	St Rn	SW
3	29 8	Wd Cd	27 7	Cy	29 6 ¹	St Cy Cd	W
4	29 1 ¹	Wd Cy Rn	28 19 ¹	Wd Rn	29 1	Wd Cy	W
5	29 8	Cy ☉ Wd	29 11	☉ Cy Wd	29 11	Fg	WNW
6	29 9	Fg	29 8	Cy Rn	29 7 ¹	Cy Sw	N
7	29 8	Cy Rn	29 3 ¹	Cy	29 1	Cy Rn	SSE
8	29 1 ¹	Dk Cd	29 1	Dk Cd	28 15	St Rn	Var.
9	28 13 ¹	Dk Cd	28 13 ¹	RnThdHl	28 14 ¹	St Rn	WSW
10	28 16 ¹	Dk Wd	28 19	Cy Wd	29 1	St Rn	S
11	29 5	Dk Fg	29 8	Cy Cd	29 12	St Cd	WSW
12	29 10	Dk Wd	29 5	Cy RnWd	28 19	St Rn	S
13	28 16	Cd Wd	28 13 ¹	Cy RnWd	29 1 ¹	CyWd Cd	WSW
14	29 10	Cy Cd	29 11 ¹	CyWd Cd	29 9 ¹	Cy Cd	W
15	28 16	Cd St Rn	28 16	Cy Cd	28 16	Fg Cd	Var.
16	29 4 ¹	Dk Cd	29 10	Wd Cd	29 14	Wd Cd	Var.
17	29 13	Dk Ft	29 11	Cd Cy Rn	29 12 ¹	Cd Fg	WNW
18	29 17 ¹	Fg Dk	29 19	Dk Fg Cd	30 1 ¹	Fg	S
19	30 1 ¹	Fg Dk	30 1 ¹	Dk	30 1 ¹	Cd	Var.
20	30 1 ¹	Fg Dk	30 1	Dk	30 2	Cy	S
21	30 1 ¹	Dk Cd	30 1 ¹	Dk Cd	30 1 ¹	Cy Cd	NE
22	30 2	Dk Cd	30 2	Dk Cd	30 2	Dk Cd	ENE
23	30 2	Dk Cd	30 2	Dk Cd	30 2 ¹	Dk Cd	ESE
24	30 2	Dk Cd	30 1 ¹	Dk Cd	30 1	Cy Cd	ESE
25	29 17 ¹	Cy Cd	29 15 ¹	Cy RnWd	29 13	Cy Rn	SSE
26	29 14	Dk	29 14 ¹	Fr ☉	29 16 ¹	Cy	Var.
27	30	Dk Fg Cd	30	Fg Cd	30 1 ¹	Fg	SE
28	30	Ft	30 1 ¹	Cy Rn Cd	30 1 ¹	Cy Cd	SSE
29	30 1 ¹	Dk Cd	30 1	Cd ☉	30 1 ¹	Cd Cy	SE
30	30 1 ¹	Dk	30 2	Cd Cy	30 3	Cd Cy	SSE
31	30 3	Dk Cd	30 3 ¹	Dk Cd	30 4 ¹	Cy Rn Cd	E

Thunder, Lightning, and Hail, 9th December Noon.

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J A N U A R Y 1755.

D	Morning.			Noon.			Night.			Wind.
1	30	3	Cy Rn	30	3½	Cd Cy Rn	30	3½	Cy Rn Cd	ENE
2	30	3½	Cy Rn	30	3	Cy Rn	30	3	Cy Rn Cd	ENE
3	30	1½	Cy Rn	30	1½	Cy Rn	30	2½	Cy RnWd	ESE
4	30	4	Dk Sw	30	4	Dk	30	4	Fg Ft	NNE
5	30	2½	Cy Rn	30	4½	○ Fg	30	6½	Ft	WNW
6	30	7½	Dk Cd	30	8½	Dk Cd	30	9	Cd Ft	WNW
7	30	7½	Dk Ft	30	7½	Dk	30	7½	Cd	WNW
8	30	6½	Dk Rn	30	6½	Dk Cd	30	5½	Cd	WNW
9	30	4	Cd ○	30	3½	○ Dk	30	4½	Dk	W
10	30	4	Fg Rn	30	4	Fg ○	30	2½	Dk	SW
11	29	18½	Dk	29	16½	○	29	12½	Rn	SW
12	29	8½	Cy RnWd	29	8½	○ Cd Wd	29	6½	Cd Wd	WSW
13	29	5½	Rn Hl Sw	29	4½	○ Cd Wd	29	5½	Cd RnWd	W
14	29	13	Ft Sw ○	29	14½	○ Cd	29	16½	Cd	W
15	29	15½	Ft	29	14	Cd	29	11	Cd Cy	WSW
16	29	½	Cy Rn	29	½	Cd Rn Sw	29	2½	Cd Rn	WNW
17	29	8½	Ft	29	8½	Cy Rn	29	6	Cy Rn	WSW
18	29	4	Cy Rn	29	3	Cy Wd	29	5	Cy Rn St	S
19	29	4½	Cy Rn	29	1½	Cy Rn St	29	2½	Cy RnWd	SSW
20	28	19½	Cy Rn	29	1½	Cy Wd ○	29	4	Cy RnWd	W
21	29	12	Cy ○	29	14½	○	29	16½	Cd Fg	WSW
22	29	16½	Ft Cy	29	16	Cy Cd	29	16½	Cy Cd	SE
23	29	19	Cy CdWd	29	19½	Cy CdWd	30	½	Cy Cd	SE
24	30		Dk Cd	29	19	Cy Cd	29	18½	Cy Cd	SE
25	29	19½	Dk ○	30	½	Cy ○ Cd	30	1½	Cy Cd	SE
26	30	2	Ft ○	30	2½	○ Cd	30	3½	Fg Cd	SE
27	30	4	Fg Ft	30	5	Cy Cd ○	30	5½	Cy Cd	NE
28	30	6½	Cy Cd	30	7½	Cd ○	30	8½	Fg Cd	NE
29	30	6½	Cy Ft	30	5	Cd ○	30	4	Fr Cd	W
30	30	2	Fg Ft	30	½	Fg ○	30	½	Cy Cd	WNW
31	30	1	Fg ○ Cd	30	1	○ Cd	30	1	Cd Fg	N

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Ds	Morning.		Noon.		Night.		Wind.
1	30	Dk Ft ☉	29 19 $\frac{1}{2}$	Ft ☉	29 19 $\frac{1}{2}$	Fg Ft	WNW
2	29 19	Dk Fg Ft	29 18 $\frac{1}{2}$	☉ Fg Rn	29 19	Rn Cd	WNW
3	29 18 $\frac{1}{2}$	Dk Ft ☉	29 19 $\frac{1}{2}$	Dk ☉ Cd	30 $\frac{1}{2}$	Fg Ft	Var.
4	30 $\frac{1}{2}$	Dk Fg Ft	30	☉ Fg Cd	29 18 $\frac{1}{2}$	Cd Fg	Var.
5	29 13	Dk Ft Wd	29 10 $\frac{1}{2}$	Cy Rn	29 7	Cy Rn Wd	SE
6	29 2 $\frac{1}{2}$	Rn	29 3 $\frac{1}{2}$	Cy Rn	29 3 $\frac{1}{2}$	Cy Rn	SE
7	29 4 $\frac{1}{2}$	Cy Wd	29 6 $\frac{1}{2}$	Dk Cy	29 9 $\frac{1}{2}$	Dk Ft	E
8	29 9 $\frac{1}{2}$	Fr ☉ Ft	29 8 $\frac{1}{2}$	☉ Fr Cd	29 7 $\frac{1}{2}$	Ft	ESE
9	29 4	Cd Dk Fg	29 2 $\frac{1}{2}$	Cd Cy ☉	29	St Hl Rn	SE
10	28 17 $\frac{1}{2}$	Cd Hl Fg	28 17 $\frac{1}{2}$	☉ Cy Rn	28 17 $\frac{1}{2}$	Cy Ft	NE
11	28 18 $\frac{1}{2}$	Ft Fg	28 18 $\frac{1}{2}$	☉ Cd Fr	28 18 $\frac{1}{2}$	Fg Ft	WNW
12	28 19 $\frac{1}{2}$	Ft ☉	29 2 $\frac{1}{2}$	Cd ☉ Fr	29 8 $\frac{1}{2}$	Cy Rn Wd	NW
13	29 14 $\frac{1}{2}$	Ft ☉	29 16 $\frac{1}{2}$	Cd ☉	29 19	Fg Ft	E
14	29 19 $\frac{1}{2}$	Dk Ft	29 18 $\frac{1}{2}$	Cy Cd Wd	29 16 $\frac{1}{2}$	Rn Wd Cd	SW
15	29 13	Cy Wd	29 11 $\frac{1}{2}$	Cy Rn ☉	29 12 $\frac{1}{2}$	Cy Rn	SW
16	29 12 $\frac{1}{2}$	Fg	29 11 $\frac{1}{2}$	Cd Fg Cy	29 7 $\frac{1}{2}$	Cy Rn	E
17	29 9 $\frac{1}{2}$	Fg Fr	29 15	Cy Cd ☉	29 15 $\frac{1}{2}$	Cy Cd Wd	NNW.
18	29 18 $\frac{1}{2}$	Fg Ft ☉	29 17 $\frac{1}{2}$	☉ Cd	29 16	Fg	SE
19	29 14 $\frac{1}{2}$	Fg Rn	29 14 $\frac{1}{2}$	Cd Rn	29 14 $\frac{1}{2}$	Rn	Var
20	29 15	Cd Rn Sw	29 15 $\frac{1}{2}$	Cd Sw Wd	29 10	Cy Cd	NE
21	29 15	Dk Sw St	29 15	Cd Sw Dk	29 14 $\frac{1}{2}$	Cd Sw	NE
22	29 10 $\frac{1}{2}$	Cd Dk Sw	29 9 $\frac{1}{2}$	Cd Dk Sw	29 8 $\frac{1}{2}$	Cd Sw	NE
23	29 9 $\frac{1}{2}$	Cd Cy Sw	29 10	Cd Sw Cy	29 12	Cy Cd	E
24	29 13 $\frac{1}{2}$	Dk Cd	29 14	Dk Cd	29 15	Dk Cd	ENE
25	29 14 $\frac{1}{2}$	Dk Cd Wd	29 12	Dk Cd	29 10 $\frac{1}{2}$	Cd Dk	E
26	29 7 $\frac{1}{2}$	Dk Cd	29 6 $\frac{1}{2}$	☉ Cd	29 7 $\frac{1}{2}$	Cd Lk	E
27	29 8 $\frac{1}{2}$	Dk Cd	29 9 $\frac{1}{2}$	Cd ☉	29 11	Cd	ENE
28	29 11 $\frac{1}{2}$	Dk Cd	29 11 $\frac{1}{2}$	Dk Cd Cy	29 11 $\frac{1}{2}$	Cy Cd	E

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D.	Morning.	Noon.	Night.	Wind.
1	29 9 $\frac{1}{2}$ Rn ☉	29 9 $\frac{1}{2}$ ☉ Cy	29 12 $\frac{1}{2}$ Dk Cd	W
2	29 13 $\frac{1}{2}$ Cy ☉	29 13 $\frac{1}{2}$ Cd Cy Rn	29 11 $\frac{1}{2}$ Cy Rn	W
3	29 12 $\frac{1}{2}$ Rn ☉	29 12 $\frac{3}{4}$ Cy ☉	29 12 $\frac{1}{2}$ Fg Cd	Var.
4	29 9 $\frac{1}{2}$ Dk ☉	29 6 ☉ Cd Wd	29 5 Cd Cy Wd	SSE
5	29 13 $\frac{1}{4}$ Dk ☉	28 18 $\frac{1}{2}$ Cd Cy Rn	29 6 Rn Cy	Var.
6	28 13 Cy Rn	28 13 Cy Rn	28 18 $\frac{1}{2}$ Hl Rn Wd	ENE
7	29 6 $\frac{1}{2}$ Dk Wd Sw	29 8 $\frac{1}{2}$ ☉ Dk	29 12 Cd Wd Sw	ENE
8	29 15 $\frac{1}{2}$ Dk Ft Sw	29 15 Dk Sw Wd	29 17 Cd Wd Sw	N
9	29 16 ☉ Ft	29 15 Dk Cd Wd	29 15 Cd Cy Rn	NNE
10	29 13 $\frac{1}{2}$ Cd Rn Wd	29 14 $\frac{1}{2}$ Dk Cd Wd ☉	29 15 Cd Dk Fg	NNW
11	29 14 $\frac{1}{2}$ Cd ☉	29 12 Cy Rn ☉ Cd	29 10 Cd Wd Rn	W
12	29 11 $\frac{1}{2}$ ☉ Wd Ft	29 13 ☉ Cd Dk	29 15 Dk Cd	N
13	29 16 $\frac{1}{2}$ ☉ Ft	29 16 $\frac{1}{2}$ Cd ☉	29 15 $\frac{3}{4}$ Cd Fg	Var.
14	29 12 ☉ Fg Ft	29 10 Cy Rn ☉	29 8 Cy Rn Cd	Var.
15	29 6 $\frac{3}{4}$ ☉ Dk Hl	29 7 Rn ☉ Hl	29 4 $\frac{1}{2}$ Cy Rn Hl	Var.
16	29 5 ☉ Dk Cd	29 5 ☉ Cy Rn	29 4 $\frac{1}{2}$ Dk Cd	SE
17	29 4 $\frac{1}{2}$ Dk Hl	29 5 $\frac{1}{2}$ Cy Rn	29 8 $\frac{3}{4}$ Dk Cd	EN
18	29 14 Dk ☉ Cd	29 15 Dk Cd	29 16 $\frac{1}{2}$ Dk Cd	E
19	29 16 Cy Rn ☉	29 14 $\frac{1}{2}$ Cy Cd Dk	29 13 $\frac{1}{2}$ Dk Cd	ESE
20	29 13 $\frac{1}{2}$ Cy Rn	29 13 $\frac{1}{2}$ Cy Rn Cd	29 13 $\frac{1}{2}$ Cy Rn Cd	SSE
21	29 11 ☉ Cd	29 10 Dk Hl Cd	29 8 Dk Cy Cd	ESE
22	29 7 $\frac{3}{4}$ ☉ Cd	29 7 $\frac{1}{2}$ Cd ☉	29 8 Dk Cd	ENE
23	29 8 $\frac{1}{2}$ ☉ Cd	29 9 Cd ☉	29 7 $\frac{1}{2}$ Dk Cd	SSE
24	29 6 $\frac{1}{2}$ Cd Cy Rn	29 8 $\frac{1}{2}$ ☉	29 9 Dk Cd	SE
25	29 6 $\frac{3}{4}$ Cy Rn	28 18 ☉ Wd Cy	29 7 $\frac{3}{4}$ Wd Cy Rn	Var.
26	29 11 Dk ☉	29 12 $\frac{1}{2}$ Wm Rn	29 12 Cy Wm	S
27	29 12 $\frac{1}{2}$ Cy Rn ☉	29 14 $\frac{1}{2}$ Cy ☉ Wm	29 14 $\frac{1}{2}$ Cy Wd Wm	S
28	29 9 $\frac{1}{2}$ Cy Rn	29 7 Cy Wd ☉ Rn	29 12 Cd Wd Rn	WSW
29	29 16 ☉	29 17 Cy Wd ☉	29 17 $\frac{1}{2}$ Cy Wd	WSW
30	29 15 Dk ☉	29 12 ☉ Wd Dk	29 10 Cy Rn Wd	S
31	29 8 Cy Rn ☉ Wd	29 4 $\frac{1}{4}$ ☉ Wd Rn	29 7 $\frac{1}{2}$ Dk Cd Wd	SSW

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D ^s	Morning.		Noon.		Night.		Wind.
1	29 10	Cd Cy Rn	29 10	Cy Rn	29 8	Cy Rn	SSE
2	29 8	Dk ☉	29 4 $\frac{1}{2}$	Cy Rn	29 2 $\frac{3}{4}$	Cy RnWd	SSE
3	29 7	Cy ☉ Rn	29 4	Cy ☉ WdRn	29 4 $\frac{1}{2}$	Cy RnWd	WSW
4	29 6 $\frac{1}{2}$	☉ Wd	29 9	☉ Wd	29 10	Dk Cy	WSW
5	29 8	Rn	29 5	RnCdWd	29 5	RnCdWd	W
6	29 7 $\frac{1}{2}$	Rn SwCd	29 8 $\frac{1}{2}$	Cy Cd St	29 7	Cy Rn St	WSW
7	29 8	☉ Rn	29 7	Rn ☉	29 7 $\frac{1}{2}$	Cy CdWd	WSW
8	29 6	Cy ☉ RnCd	29 5	Rn Wd	29 5 $\frac{1}{2}$	Cy CdWd	WSW
9	29 5	Dk ☉	29 7 $\frac{1}{2}$	Cy Rn	29 9	Dk Cd	WSW
10	29 9 $\frac{1}{2}$	☉	29 10	☉	29 9	DkCdWd	E
11	29 7	Cy Rn	29 6 $\frac{1}{2}$	☉ Dk	29 5 $\frac{1}{2}$	Cy Rn	SSE
12	29 2	Wd ☉ Rn	29 1 $\frac{1}{2}$	Wd ☉ Rn	29 8 $\frac{1}{2}$	Cy Rn	WSW
13	29 11	☉ Wd	29 11 $\frac{1}{4}$	☉ Wd	29 11	DkWdCd	SW
14	29 11	Dk ☉ Rn	29 12	Cy ☉ Wd	29 12 $\frac{1}{2}$	RnCdWd	SW
15	29 13 $\frac{1}{2}$	Cy Rn ☉	29 16 $\frac{1}{2}$	☉ Wm	30	Dk Cd	WSW
16	29 18 $\frac{1}{2}$	Cy Rn	29 17	☉	29 17	Dk Cy	SW
17	29 15	Rn	29 15	Cy Rn	29 16	Dk	W
18	29 17	Dk ☉	29 17	☉	29 15	Dk	S
19	29 13 $\frac{1}{2}$	Dk ☉ Cy	29 14 $\frac{1}{2}$	Cy Rn	29 14	Cy Dk	S
20	29 12 $\frac{1}{2}$	Rn Fg	29 12	Dk ☉	29 10 $\frac{1}{2}$	Dk	E
21	29 10	☉ Cy	29 11	Cy ☉	29 12	Dk	E
22	29 12	☉ Cy	29 11 $\frac{1}{2}$	Cy	29 12	Cy	E
23	29 10	Dk ☉	29 9	☉ Wd	29 7 $\frac{1}{2}$	Wd Cd	E
24	29 7 $\frac{1}{2}$	Cy Rn	29 7 $\frac{1}{2}$	Rn Cy	29 8	Cy Cd	ESE
25	29 8	☉	29 9	☉ Cy Rn	29 8 $\frac{1}{2}$	Cy Rn	E
26	29 8	Dk Cy	29 8	Dk ☉	29 8	Cy Cd	E
27	29 6	Cy Rn	29 6	Cy RnCd	29 6	Cy Cd	WNW
28	29 5 $\frac{1}{2}$	☉ Rn HI	29 5	☉ Rn HI	29 7	Cd Cy Rn	WNW
29	29 10	☉ HI Cd	29 12 $\frac{1}{2}$	HI Cd Rn	29 15 $\frac{1}{2}$	HI Rn Cd	NW
30	29 14 $\frac{1}{2}$	Cd ☉ Cy	29 13	Cy Rn	29 11 $\frac{1}{2}$	Cy RnCd	WSW

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M A Y 1755.

D ^s	Morning.	Noon.	Night.	Wind.
1	29 10 Cy Rn	29 10 $\frac{1}{2}$ Cy ☉ Rn	29 9 Cy Rn	WSW
2	29 7 $\frac{1}{2}$ Rn Cd	29 8 Rn Cd	29 11 Cd Rn	NE
3	29 13 $\frac{1}{2}$ ☉ Cd	29 14 $\frac{1}{2}$ ☉ Rn Hl	29 15 $\frac{1}{2}$ Dk Cd Hl	W
4	29 15 Cd Cy ☉	29 14 ☉ Cy Rn	29 13 Dk Cd Wd	WSW
5	29 11 $\frac{1}{2}$ Cy Rn ☉	29 11 ☉ Rn Wd	29 10 $\frac{1}{2}$ Cy Cd	WSW
6	29 7 ☉ Hl Rn	29 7 $\frac{1}{2}$ Rn Hl Wd	29 9 $\frac{1}{2}$ Cy Cd	WSW
7	29 10 $\frac{1}{2}$ ☉ Hl Rn	29 11 ☉ Hl Rn	29 14 Fr Cd	NW
8	29 14 $\frac{1}{2}$ Cy Rn	29 16 $\frac{1}{2}$ Cy Hl Rn	29 18 $\frac{1}{2}$ Cy	NW
9	29 18 $\frac{1}{2}$ Fr	29 18 ☉	29 16 Dk	Var.
10	29 14 ☉	29 14 ☉ Rn	29 14 Cd Fg	WNW
11	29 13 ☉	29 11 ☉ Rn	29 11 Cd Cy Rn	W
12	29 11 Cy ☉	29 12 Rn Hl Thd	29 14 Cy Rn Hl	Var.
13	29 15 $\frac{1}{2}$ Cy ☉	29 16 $\frac{1}{2}$ ☉ Cy Wm	29 17 $\frac{1}{2}$ Wm Fg	NE
14	29 16 Fr ☉	29 15 Cy ☉	29 13 Cy Rn	SSE
15	29 11 Cy Rn	29 11 Cy ☉ Rn	29 14 $\frac{1}{2}$ Cy	W
16	29 11 $\frac{1}{2}$ Fr ☉	29 17 ☉ Cy Rn	29 17 $\frac{1}{2}$ Cy Rn Cd	WNW
17	29 18 $\frac{1}{2}$ Cy ☉	30 ☉	30 2 $\frac{1}{2}$ Cd	NNW
18	30 3 $\frac{1}{2}$ ☉	30 4 ☉ Wm	30 4 $\frac{1}{2}$ Fr Rn	WNW
19	30 3 $\frac{1}{2}$ Dk ☉	30 4 Cy Rn ☉	30 4 Fr	WNW
20	30 3 ☉ Cy	30 3 Cy ☉ Wm	30 2 $\frac{1}{2}$ Fr	WNW
21	30 2 Cy ☉	30 2 $\frac{1}{2}$ Cy ☉ Wm	30 2 $\frac{1}{2}$ Fr	NW
22	29 18 Dk ☉	30 3 $\frac{1}{2}$ Dk Wm	30 3 $\frac{1}{2}$ Fr	N
23	30 3 $\frac{1}{2}$ ☉	30 4 ☉ Wm	30 3 $\frac{1}{2}$ Fr	N
24	30 3 Dk ☉	30 2 $\frac{1}{2}$ ☉	30 2 Cy Cd	N
25	30 1 ☉ Cy Cd	30 1 $\frac{1}{2}$ ☉ Cy Cd	30 2 Cy Cd	ENE
26	30 ☉ Cy	29 19 $\frac{1}{2}$ Cy	29 19 Dk	NE
27	29 18 $\frac{1}{2}$ ☉ Cy	29 17 $\frac{1}{2}$ ☉ Wm Wd	29 17 $\frac{1}{2}$ Rn Cy	W
28	29 19 $\frac{1}{2}$ ☉ Wd Cy	30 2 $\frac{1}{2}$ ☉	30 2 Fr	NW
29	30 ☉	29 19 ☉ Cy	29 16 $\frac{1}{2}$ Rn Cy	WSW
30	29 12 Cy Rn	29 9 $\frac{1}{2}$ Rn	29 9 $\frac{1}{2}$ Rn	Var.
31	29 9 $\frac{1}{2}$ Cy ☉	29 9 $\frac{1}{2}$ ☉ Cy	29 12 Cy	WNW

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Ds	Morning.		Noon.		Night.		Wind.
1	29 13	☉ Cy	29 13	☉	29 16	Fr Cd	SE
2	29 17	☉	29 18	☉	29 18½	Fr Cd	E
3	29 18	Dk ☉	29 19	☉ Wm	29 19	Fr Rn	ENE
4	29 18	☉	29 18	☉ Wm	29 17	Fr Cd Wd	NE
5	29 16½	☉	29 15½	☉ Cy	29 14½	Rn Cy	NE
6	29 14	Cy Rn	29 13½	☉ Rn	29 13	Cy	E
7	29 13	Rn Thd	29 13	Rn	29 13	Cy	E
8	29 13½	Cy ☉ Rn	29 13	Rn ☉ Cy	29 14	Fr	W
9	29 14	Dk	29 13¾	Cy Rn	29 14	Cy	E
10	29 14½	Dk	29 15½	Dk Cd	29 17	Cy Cd	NE
11	29 17¾	☉	29 18	☉	29 17½	Fr Cd	ENE
12	29 17½	Dk ☉ Wm	29 16	☉ Wm	29 15	Fr Cd	E
13	29 12¾	Cy Rn	29 12	Cy Rn ☉	29 12	Cy	ESE
14	29 12	☉ Wd	29 12½	☉ Wd	29 11	Cy Rn	ESE
15	29 10	Cy Cd	29 10½	☉ Rn Wd	29 11	Cy	SE
16	29 11	☉	29 13	Dk	29 14½	Rn	WSW
17	29 14	Cy Rn	29 15½	☉ Cy Wd	29 18½	Fr Wd	W
18	29 18	☉ Rn	29 15	Cy Rn	29 14	Cy Rn	S
19	29 13	Cy ☉	29 13½	Rn Cy	29 14½	Cy	S
20	29 15	☉	29 15	☉	29 16½	Fr	W
21	29 17	☉	29 17	☉ Wm	29 16	Fr	ENE
22	29 14½	Cy	29 12	Cy	29 8	Rn	SE
23	29 7½	☉ Rn	29 7½	☉ Rn	29 6½	Rn Cy	Var.
24	29 9	Cy Rn ☉	29 9½	☉	29 13	Fr	NNE
25	29 14½	☉	29 16	☉	29 15	Fr	Var.
26	29 14	☉	29 13	Cy	29 12	Rn Cy	ESE
27	29 12	Cy ☉	29 12	Cy	29 11	Rn Cy	W
28	29 10½	Cy ☉	29 11	Rn ☉	29 11	Rn Cy	Var.
29	29 13	☉	29 12	☉ Cy	29 5	Rn	Var.
30	29	Cy Rn	29	Cy Rn	29 1½	Rn Cy	Var.

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D ^s	Morning.			Noon.			Night.			Wind.
1	29	3	Cy Rn	29.	4 $\frac{1}{2}$	Cy Wd ☉	29	7 $\frac{1}{2}$	Cy	NW
2	29	9	☉ Cy	29	9 $\frac{1}{2}$	☉ Cy Rn	29	9	Cy Cd	WNW
3	29	10	Cy ☉ Rn	29	12	☉ Cy	29	14 $\frac{1}{2}$	Fr	WNW
4	29	14	☉	29	14 $\frac{1}{2}$	☉	29	14 $\frac{1}{2}$	Cy	SW
5	29	14 $\frac{1}{2}$	Rn ☉	29	14 $\frac{1}{2}$	Rn ☉	29	15	Cy	SW
6	29	14 $\frac{1}{2}$	Rn ☉	29	16	Rn ☉	29	18	Rn	Var.
7	29	18 $\frac{1}{2}$	Cy ☉	29	19 $\frac{1}{2}$	☉	30		Cy	Var.
8	30		☉	29	19 $\frac{1}{2}$	☉ Cy	29	16 $\frac{1}{2}$	Cy Cd Rn	Var.
9	29	12 $\frac{1}{2}$	Cy Rn	29	11 $\frac{1}{2}$	Cy Rn	29	8 $\frac{1}{2}$	Rn	W
10	29		Rn Cy ☉	29		Rn Cy St	29	1	Rn St	WSW
11	29	5	☉	29	7	☉ Cy	29	10	Rn Cy Cd	WSW
12	29	11	Dk ☉ Rn.	29	11	Cy ☉ Rn	29	10	Cy Cd	ESE
13	29	10	Cy ☉	20	10	☉ Cy Wm	29	11	Cy Cd	WSW
14	29	11	Cy ☉ Rn.	29	11 $\frac{1}{2}$	Rn ☉	29	11	Rn	SSW
15	29	11 $\frac{1}{2}$	Cy ☉	29	11 $\frac{1}{2}$	Cy ☉ Wm	29	11	Cy Wd Rn	ESE
16	29	10	Cy ☉ Rn	29	12	☉	29	13 $\frac{1}{2}$	Cy	WSW
17	29	13 $\frac{1}{2}$	Dk	29	12 $\frac{1}{2}$	Dk Rn	29	6 $\frac{1}{2}$	Rn Wd Cd	Var.
18	29	4 $\frac{1}{2}$	Cy Rn St	29	10	Cy Wd ☉	29	17	Fr Wm	WNW.
19	29	17 $\frac{1}{2}$	Cy Rn	29	17	Rn	29	14	Rn Cy Cd	Var.
20	29	14 $\frac{1}{2}$	Dk ☉	29	14 $\frac{3}{4}$	☉ Cy Wd	29	15	Cy Wd Cd	W
21	29	13	Rn	29	10 $\frac{1}{2}$	Rn ☉	29	10	Rn Cy	E
22	29	9 $\frac{1}{2}$	Cy ☉	29	10	Cy ☉	29	11	Cy	NW
23	29	11	Cy ☉	29	12 $\frac{1}{2}$	☉	29	12 $\frac{1}{2}$	Cy	E
24	29	13	☉ Rn	29	14	Cy ☉	29	15 $\frac{1}{2}$	Dk Cd	NE
25	29	15	Cy Rn	29	16	Cy ☉	29	14 $\frac{1}{2}$	Cy Cd	NNW
26	29	12 $\frac{1}{2}$	Dk ☉	29	12 $\frac{1}{2}$	Cy	29	13	Cy Cd	NW
27	29	15	☉	29	16 $\frac{1}{2}$	☉	29	19	Fr	N
28	29	18	Cy	29	17	Cy	29	15	Rn Cy	W
29	29	12	Cy Rn ☉	29	13 $\frac{1}{2}$	☉	29	14 $\frac{1}{2}$	Cy Wd	W
30	29	15 $\frac{1}{2}$	Dk ☉	29	17	Dk ☉	29	18 $\frac{1}{2}$	Fr	WNW
31	29	18	☉	29	18	☉	29	17	Fr	WNW

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AUGUST 1755.

D ^s	Morning.		Noon.		Night.		Wind.
1	29 16	☉ Rn	29 16	Rn Wd	29 16	Rn Cy	W
2	29 15	Cy ☉	29 14	☉ Cy Rn	29 11	Rn Cy	W
3	29 7	Cy ☉ Cd	29 6	Hl Rn ☉	29 7½	Hl Rn Cd	NW
4	29 9	Cy Cd	29 11	Cy Cd	29 13	Cy Cd	NW
5	29 14	☉ Cd	29 15	Cy Cd	29 17	Dk Cd	NNW
6	29 17	Dk Cd	29 17½	☉ Wm	29 18	Cy	N
7	29 18½	Dk ☉ Ht	29 19	☉ Ht	29 19	Fr	ENE
8	29 18½	Dk ☉ Rn	29 18½	Rn ☉	29 19½	Fr	Var.
9	30	Dk ☉ Rn	30	Cy	30 1½	Fr	NW
10	30 1½	☉	30 1½	☉ Ht	30 1½	Fr	ENE
11	30	☉	29 19¾	☉ Ht	29 18¾	Cy	E
12	29 17	☉	29 16	☉ Rn	29 15	Cy	E
13	29 14	Cy Rn	29 14	☉ Cy	29 14	Fr	E
14	29 13½	Cy ☉	29 13	Cy	29 12	Cy Wd	ESE
15	29 10	Rn	29 8½	☉	29 8½	Rn Cy Wd	ESE
16	29 9	Cy ☉	29 8½	☉ Ht	29 7½	Rn	SE
17	29 11	☉ Wd	29 13	☉ Wd	29 14½	Cy Wd	SW
18	29 14½	Cy ☉	29 14½	☉ Ht	29 11½	Cy Wd	SSE
19	29 7	Cy Rn	29 8½	Rn ☉	29 11	Cy Cd	W
20	29 13	☉ Cy	29 13½	Cy	29 13½	Cy Cd	W
21	29 12½	Cy Rn	29 10	Rn	29 12	Cy	W
22	29 12½	☉ Rn	29 13	☉ Rn	29 13½	Cy Cd	W
23	29 13	Cy ☉	29 12½	☉ Rn Wd	29 13	Cy Wd	W
24	29 12½	Cy Rn Wd	29 14	☉ Cy Wd	29 15½	Rn Wd	W
25	29 15½	Cy Dk	29 17½	Dk	29 18½	Cy	WNW
26	29 19½	Dk ☉	30 0	☉	29 19½	Cy	NW
27	29 19½	Cy Rn	29 19½	☉ Cy	29 19½	Cy	NNW
28	29 18½	Dk ☉	29 15½	Rn ☉	29 13½	Rn	WNW
29	29 13½	Rn	29 15	☉	29 16	Cy	WNW
30	29 14	Cy Cd	29 11	Cy Cd Rn	29 5	Cy Cd	SSE
31	29 4½	Cy Wd	29 5	Cy Rn ☉	29 1	Cy St	W

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S E P T E M B E R 1755.

D ^s	Morning.		Noon.		Night.		Wind.
1	28 10	Rn St	28 12	Rn Wd	28 18	Rn Wd	WNW
2	29 6	Rn Wd ☉	29 10 $\frac{1}{2}$	Cy Wd	29 15	Fr	Var.
3	29 15 $\frac{1}{2}$	☉	29 13 $\frac{1}{2}$	Rn	29 11	Cy	NW
4	29 10	Cy ☉	29 10 $\frac{1}{2}$	☉ Cy	29 13 $\frac{1}{2}$	Fr	W
5	29 13	Rn	29 13 $\frac{1}{2}$	Rn	29 14	Cy	SSE
6	29 16	Cy ☉	29 17	☉ Cy	29 17	Cy	WNW
7	29 18	☉ Rn	29 17 $\frac{1}{2}$	☉ Wd	29 19	Cy	W
8	29 18 $\frac{1}{2}$	Dk ☉	29 17 $\frac{1}{2}$	☉	29 18 $\frac{1}{2}$	Cy	W
9	29 13 $\frac{1}{2}$	☉ Wd	29 14 $\frac{1}{2}$	Wd Rn	29 16	Fr Cd	NW
10	29 19	Dk ☉ Cd	29 19	☉ Dk Cd	29 19 $\frac{1}{2}$	Cd Fr	NW
11	29 16 $\frac{1}{2}$	Dk ☉ Cd	29 16	☉ Cd Rn	29 15 $\frac{1}{2}$	Cy Cd	Var.
12	29 14 $\frac{1}{2}$	Rn ☉	29 14 $\frac{1}{2}$	☉ Dk	29 15	Cy	WSW
13	29 16 $\frac{1}{2}$	Cy ☉	29 17	Cy ☉	29 17	Dk	W
14	29 17 $\frac{1}{2}$	☉	29 16 $\frac{1}{2}$	☉	29 16	Cy	W
15	29 14 $\frac{1}{2}$	☉	29 13 $\frac{1}{2}$	☉	29 13	Cy	SSE
16	29 15	☉	29 15	☉	29 16	Fg	SE
17	29 13 $\frac{1}{2}$	Dk	29 13	Dk ☉ Wd	29 13 $\frac{1}{2}$	Cy	SE
18	29 12 $\frac{1}{2}$	Cy Rn	29 12 $\frac{1}{2}$	Rn	29 12	Rn	SSE
19	29 11	Rn	29 11	Rn	29 13 $\frac{1}{2}$	Fr Wd	E
20	29 13	☉	29 13	☉	29 12 $\frac{1}{2}$	Rn Wd	E
21	29 10	Rn Wd	29 10	Cy	29 11	Cy	ESE
22	29 11	Cy	29 10	Cy	29 10 $\frac{3}{4}$	Cy	ENE
23	29 10	Rn	29 10 $\frac{1}{2}$	Cy	29 12	Cy	ENE
24	29 12 $\frac{1}{2}$	Cy	29 14	☉	29 14 $\frac{1}{2}$	Fg	SE
25	29 14 $\frac{1}{2}$	☉	29 13	Cy	29 11	Cy	S
26	29 3	St Rn	29 3	Cy Rn	29 2 $\frac{1}{2}$	Cy	SW
27	29 1 $\frac{1}{2}$	☉	29 2 $\frac{1}{2}$	☉	29 5 $\frac{1}{2}$	Fr	WNW
28	29 8	☉	29 8	☉	29 4	St Rn	S
29	28 17 $\frac{1}{2}$	☉ Rn	28 17 $\frac{1}{2}$	☉ Rn	29 2	Wd Cy	SW
30	29 4 $\frac{1}{2}$	Cy Rn	28 19 $\frac{1}{2}$	Rn	28 18 $\frac{1}{2}$	Rn St	WSW

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OCTOBER 1755.

D ^s	Morning.			Noon.		Night.			Wind.	
1	29	5	☉	29	9	☉ Rn	29	11½	Fr Wd Cd	Var.
2	29	10	Cy Rn	29	10	Rn	29	5	Rn Cy	WSW
3	29	2½	Cy	29	6	Cy ☉	29	9½	Fr Cd	Var.
4	29	10	Rn ☉	29	12	☉ Wm	29	13½	Fr	W
5	29	14½	☉	29	14½	☉ Wm	29	15	Cy Wm	Var.
6	29	17	☉	29	16½	☉ Cy	29	16	Fr Cd	WSW
7	29	14½	Cy Rn	29	15½	☉	29	17½	Fr Wm	W by S
8	29	18½	☉	29	18½	☉	29	16½	Wd	SW
9	29	11½	☉ Wd Rn	29	11	☉ Rn Wd	29	13	Fr Wd Cd	WSW
10	29	12½	Wd ☉	29	13	Wd Rn ☉	29	15	Fr Wd Cd	WNW
11	29	16½	☉ Cd Wd	29	16½	Wd Cd Hl ☉	29	17½	Ft	WNW
12	29	17	☉ Cd	29	18½	☉ Cd	29	19½	Cd Fg	NNE
13	29	19½	☉	29	19½	☉	30		Cd Fg	Var.
14	29	17½	Fg ☉	29	15½	☉	29	12½	Fg Cd	Var.
15	29	8	Fg Rn	29	6	☉ Rn	29	3½	Rn	WSW
16	29	1½	Rn Fg	29	½	☉	29	3	Cy Cd	W
17	29	8½	Cd Fg ☉	29	10½	☉	29	12¾	Cd	ENE
18	29	12½	Dk Cd ☉	29	13	☉ Dk Cd	29	12½	Cd	ENE
19	29	13	Cy Rn	29	13½	Cy ☉	29	16	Fr	ENE
20	29	16¾	Dk Cd Ft	29	17½	Dk ☉	29	18	Fr Fg	WNW
21	29	18	☉	29	17	☉	29	15½	Cd Fg	WNW
22	29	12½	☉	29	12½	☉ Cy Rn	29	13	Cy	WNW
23	29	15	☉ Cd Ft	29	13½	☉ Rn	29	8½	Rn Cd Wd	WNW
24	29	7½	☉ Wd Cd	29	8½	☉ Cy Wd Cd	29	14½	Cy Cd Wd	WNW
25	29	17	☉ Wd	29	19½	☉ Rn Cd	30	2	Cy Cd Wd	WNW
26	30	1	Dk ☉ Cd	30		☉ Cd	30		Dk Cd	W
27	30		☉	30	1	☉	30	2	Fr	W
28	30	2¾	Dk	30	2½	Dk Fg	30	3	Fg	Var.
29	30	3	Dk Fg	30	4	Dk	30	5	Fg	W
30	30	5	Fg Dk	30	5	Dk	30	5	Fg	Var.
31	30	4½	Fg ☉	30	5	Dk	30	5½	Fg	Var.

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N O V E M B E R 1755.

D.	Morning.			Noon.		Night.		Wind.		
1	30	5	Fg Dk Cd	30	4	Dk	30	3	Fg Cd	W
2	29	19	Cy Wd	29	19	Cy	29	17½	Cy Wd	WSW
3	29	15	Cy Wd	29	14¾	Rn Cy Wd	29	16	Cy Cd Wd	W by S
4	29	14	Cy Fg ☉	29	11½	☉	29	10	Cy Cd	W
5	29	4½	Cy Cd	29	5	Cy ☉ Cd	29	8	Fr Cd	WNW
6	29	11	Cy Fg	29	11½	☉ Cd	29	12	Fg Cd Wd	WNW
7	29	7½	Dk Fg Ft	29	3½	Sw Rn	29	2	Sw Rn Wd	E
8	28	18	Cy Wd Hl	28	19½	Hl Rn Wd	29	2¾	Rn Cd Wd	NE
9	29	5	Fg Ft ☉	29	5	☉ Cd	29	7	Cd	WNW
10	29	5	Fg Ft Sw	29	5	Dk Cd	29	6½	Cd	NW
11	29	11½	Fg Cd	29	12	Dk Cd Rn	29	10	Cd	W
12	29	7	Dk Cd ☉	29	5	☉ Cy	29	4½	Rn	WNW
13	28	17	Cy Rn	28	13½	Rn ☉	28	12	Rn Cy	Var.
14	28	14½	Cy Rn Wd	28	18¾	Cy Wd ☉	29	3	Fr Cd	NNW
15	29	6	Dk Ft	29	7	Dk ☉ Cd	29	8½	Fg Cd	WNW
16	29		Cy Rn St	28	13½	Rn St	28	13¾	Cy Wd	SW
17	28	11½	Cy ☉	28	9½	Cy ☉	28	6½	Fr Wd	SSW
18	28	9½	Cy St	28	11¾	Cy Rn Wd	28	14½	Cy Cd Wd	WSW
19	28	14½	Cy	28	14	Cy Rn	28	16	Cy Cd	WSW
20	28	18¾	Cy ☉	29	2½	Cy ☉	29	7¾	Cy Rn	W
21	29	2½	Cy ☉ Rn	29	4½	☉ Cy	29	6½	Cy	WSW
22	29	2	Cy Rn	29	2½	Cy ☉ Hl	29	2½	Rn St Cd	WSW
23	28	18½	St Rn Cy	28	17½	Rn Hl Wd	29	1	Rn Cd Wd	WSW
24	29	4	Cy	29	4	Cy	29		Cy	Var.
25	29		Cy ☉	29	1	Cy ☉ Cd	29	4	Cy Cd	NNW
26	29	6½	Dk Ft	29	8½	Cy Cd	29	11	Cy Cd	NW
27	29	14½	Fg Ft	29	15	Cy Cd ☉	29	15¾	Cy Cd	NW
28	29	16½	Fg Ft	29	17	Dk Sw	29	17¾	Hl Rn Cd	NNW
29	29	18	Fg Ft ☉	29	18	☉ Dk Ft	29	19	Sw Fg	NW
30	29	16½	Fg Cd	29	15	Dk Cd	29	13½	Fg Cd	WNW

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D E C E M B E R 1755.

D ^s	Morning.				Noon.			Night.			Wind.
1	29	5 $\frac{1}{2}$	Cy Rn	☉	29	3 $\frac{1}{2}$	☉ Cy	29	5 $\frac{1}{2}$	Cy Rn Hl	W
2	29	10	Cy Rn	☉	29	11	☉ Cy	29	13 $\frac{1}{2}$	Cy Rn	NNE
3	29	13 $\frac{1}{2}$	Fg Cd		29	13 $\frac{1}{2}$	Cy Cd	29	11 $\frac{1}{2}$	Rn	W
4	29	13 $\frac{1}{2}$	Cy Cd		29	14 $\frac{1}{2}$	Cy ☉	29	17	Cy	NW
5	29	19	Ft ☉		29	19 $\frac{1}{2}$	☉ Cd Dk	30		Fg Ft	NE
6	29	19 $\frac{1}{2}$	Fg Ft ☉		29	19 $\frac{1}{2}$	☉ Ft	29	18 $\frac{1}{2}$	Cy	WSW
7	29	15	Cy Rn		29	16	Rn	29	15 $\frac{1}{2}$	Rn	W
8	29	14 $\frac{1}{2}$	Rn Cy		29	14 $\frac{1}{2}$	Rn Cy	29	14 $\frac{3}{4}$	Cy Wd	WSW
9	29	13	Cy		29	10 $\frac{1}{2}$	☉ Rn Wd	29	9	Rn	WSW
10	29	11 $\frac{1}{2}$	Cy ☉		29	12 $\frac{1}{2}$	☉ Cy	29	12 $\frac{1}{2}$	Cy	WSW
11	29	9 $\frac{1}{2}$	Fg Rn		29	7 $\frac{1}{2}$	Rn Cy	29	9 $\frac{1}{2}$	Cy	NNE
12	29	13	☉ Ft Cd		29	14	☉ Cd	29	14 $\frac{1}{2}$	Ft	W
13	29	9 $\frac{1}{2}$	Dk Cy Rn		29	5	Rn	29	8 $\frac{1}{2}$	Cy	SSE
14	29	6	Dk Cy		29	4	Rn Sw	29	7	Ft	SSE
15	29	4 $\frac{1}{2}$	Cy Rn Ft		28	17	Rn St	28	12 $\frac{3}{4}$	Wd Rn Cy	SE
16	28	14 $\frac{1}{2}$	Rn Wd ☉		28	15	Wd ☉ Cy	28	15 $\frac{1}{2}$	Cy	WSW
17	28	14 $\frac{1}{2}$	Cy		28	14	Cy	28	14	Cy Cd	ESE
18	28	17 $\frac{1}{2}$	† Fg ☉		28	19	☉	29	1 $\frac{1}{2}$	Cy	S
19	29		Fg ☉		28	18 $\frac{1}{2}$	☉	28	17 $\frac{1}{2}$	Rn Ft	SSW
20	28	18 $\frac{1}{2}$	☉ Wd Ft		28	19	☉ Wd Cd	29		Wd flashes	WSW
21	29	18 $\frac{1}{2}$	☉ Wd Rn		29	1	☉ Wd Rn	29	6 $\frac{1}{2}$	Cy	W
22	29	14 $\frac{1}{2}$	☉ Ft Fg		29	15	Dk ☉	29	14	Fg Rn	WSW
23	29	12	Fg ☉		29	15	☉	29	16 $\frac{1}{2}$	Fg	WSW
24	29	17 $\frac{1}{2}$	Fg ☉		29	15	Dk	29	11	Rn Wd	WSW
25	29	11 $\frac{1}{2}$	☉		29	12 $\frac{1}{2}$	☉	29	12 $\frac{1}{2}$	Fg	WSW
26	29	6	Dk		29	5	Dk	29	4 $\frac{1}{2}$	Dk St	SW
27	29	6	Cy ☉ Wd		29	5	☉ Wd Cy	29	5 $\frac{1}{4}$	Rn St	SW
28	29	4	Cy St ☉		29	5 $\frac{1}{2}$	☉ Hl Sw Rn	29	6 $\frac{1}{2}$	St Cd	WSW
29	29	7 $\frac{1}{4}$	☉ Wd		29	8	☉ Wd	29	9 $\frac{1}{2}$	Wd Cd	WSW
30	29	14	☉ Fg		29	15	☉	29	17 $\frac{1}{2}$	Fg	WSW
31	29	16	Rn ☉		29	14 $\frac{1}{2}$	Cy ☉	29	14 $\frac{3}{4}$	Fg	WSW

† The 18th at 4 o'Clock P. M. a red Light like Fire.

CXI. *An Account of what happened at Bergemoletto, by the tumbling down of vast Heaps of Snow from the * Mountains there, on March 19, 1755: As taken by the Intendant of the Town and Province of Cuneo. Received from Dr. Joseph Bruni, Professor of Philosophy at Turin, and F. R. S. Communicated by Mr. Henry Baker, F. R. S. Translated from the Italian.*

Read Nov. 11, 1756. **I**N the neighbourhood of Demonte, as one descends through the upper Valley of Stura, on the left hand, about an hour and half distant from the road leading to the castle of Demonte, towards the middle of the mountain, there were some houses in a place called by the inhabitants Bergemoletto, which on the 19th of March, in the morning, (there being then a great deal of snow) were intirely overwhelmed and ruined by two vast bodies of snow, that tumbled down from the

* A remarkable instance of the fall of a vast mass of snow from the Alps, and of mischief occasioned by it, is mentioned by Paulus Jovius in his Life of Pompeius Columna.—“ Pompeius—trans Alpes
 “ contendit, quo itinere summum se vitæ periculum adiisse sæpe
 “ memorabat, quum ipso Petinas superante Alpes devoluta in-
 “ gens e summis Alpium jugis nivium moles permultos omnis ge-
 “ neris mortales, et in his integram Sedunorum legationem paucis
 “ ante se passibus oppressisset.”

upper mountain. All the inhabitants were then in their houses, except one Joseph Rochia, a man of about 50, who with his son a lad of 15, were on the roof of his house, endeavouring to clear away the snow, which had fallen without any intermission for three preceding days. A priest going by to mass advised him to come down, having just before observed a body of snow tumbling not far distant from the said Rochia's house, but which being not large had done no harm. The man imagining this small mass would be followed by larger ones, got down from the roof with great precipitation, and fled with his son he knew not whither: but scarce had he got thirty or forty steps, before his son, who followed him, fell down: on which looking back, he saw his own house and those of his neighbours covered with an high mountain of snow. He lifted up his son, and then reflecting that his wife, his sister, two of his children, and all his effects, were buried under this vast heap of snow, he fainted away; but soon after recovering got safe to a friend's house.

Two-and-twenty persons were buried under this vast mass of snow, which was 60 English feet in height, inasmuch that many men, who were ordered to give them all possible assistance, despaired of being able to do them the least service.

After five days, Joseph Rochia having recovered of his fright, and being able to work, got upon the snow (with his son, and two brothers of his wife) to try if they could find the exact place under which his house and stable were buried; but though many openings were made in the snow, they could not find the desired place. However the month of

April proving very hot, the snow beginning to soften, and indeed a great deal of it melted, this unfortunate man was again encouraged to use his best endeavour to recover the effects he had in the house, and to bury the remains of his family. He therefore made new openings in the snow, and threw earth into them, which helps to melt the snow and ice. On the 24th of April the snow was greatly diminished, and he conceived better hopes of finding out his house, by breaking the ice (which was six English feet thick) with iron bars, and observing the snow to be softer underneath the ice, he thrust down a long pole, and thought it touched the ground; but the evening coming on he proceeded no farther.

His wife's brother, who lived at Demonte, dreamed the same night, that his sister was still alive, and begged him to help her. Affected by this dream, he rose early in the morning, and went to Bergemolletto, where he told his dream to Joseph and his neighbours; and, after resting himself a little, went with them to work upon the snow, where they made another opening, which led them to the house they searched for; but finding no dead bodies in its ruins, they sought for the stable, which was about 240 English feet distant, and having found it, they heard a cry of "Help, my dear brother." Being greatly surprized as well as encouraged by these words, they laboured with all diligence till they had made a large opening, through which the brother who had the dream immediately went down, where the sister with an agonizing and feeble voice told him, "I have always trusted in God and you, that you would not forsake me." The other brother
and:

and the husband then went down, and found still alive the wife about 45, the sister about 35, and a daughter about 13 years old. These women they raised on their shoulders to men above, who pulled them up, as it were from the grave, and carried them to a neighbouring house: they were unable to walk, and so wasted that they appeared like mere shadows. They were immediately put to bed, and gruel made with rye-flour and a little butter was given to recover them. Some days after the Intendant came to see them, and found the wife still unable to rise from her bed, or use her feet, from the intense cold she had endured, and the uneasiness of the posture she had been in. The sister, whose legs had been bathed with hot wine, could walk with some difficulty; and the daughter needed no farther remedies, for she was quite recovered.

On the Intendant's interrogating the women, they told him, that their appetite was not yet returned; that the little food they eat (excepting broths and gruels) lay heavy on their stomachs, and that the moderate use of wine had done them great good: they also gave him the account that follows.

In the morning of the 19th of March we were in the stable, with a boy 6 years old and a girl about 13: in the same stable were 6 goats, one of which having brought forth 2 dead kids the evening before, we went to carry her a small vessel full of rye-flour gruel; there were also an ass and 5 or 6 fowls. We were sheltering ourselves in a warm corner of the stable till the church bell should ring, intending to attend the service.

The wife relates, that wanting to go out of the stable to kindle a fire in the house for her husband, who was

then clearing away the snow from the top thereof, she perceived a mass of snow breaking down towards the east, on which she went back into the stable, shut the door, and told her sister of it. In less than three minutes they heard the roof break over their heads, and also part of the ceiling of the stable. The sister advised her to get into the rack and manger, which she did very carefully. The ass was tied to the manger, but got loose by kicking and struggling, and though it did not break the manger, it threw down the little vessel, which the sister took up, and used afterwards to hold the melted snow which served them for drink.

Very fortunately the manger was under the main prop of the stable, and thereby resisted the weight of the snow. Their first care was to know what they had to eat: the sister said, she had in her pocket fifteen white chesnuts: the children said they had breakfasted, and should want no more that day. They remembered there were 30 or 40 loaves in a place near the stable, and endeavoured to get at them, but were not able, by reason of the vast quantity of snow. On this they called out for help as loudly as they possibly could, but were heard by nobody. The sister came again to the manger, after she had tried in vain to come at the loaves, gave two chesnuts to the wife, and eat two herself, and they drank some snow water. All this while the ass was very restless and continued kicking, and the goats bleated very much, but soon after they heard no more of them. Two of the goats however were left alive, and were near the manger; they felt them very carefully, and knew by so doing that one of them

them was big, and would kid about the middle of April; the other gave milk, wherewith they preserved their lives.

The women affirmed, that during all the time they were thus buried, they saw not one ray of light, nevertheless for about twenty days they had some notion of night and day; for when the fowls crowed they imagined it was break of day: but at last the fowls died.

The second day, being very hungry, they eat all the remaining chesnuts, and drank what milk the milch goat yielded, which for the first days was near two pounds a day, but the quantity decreased gradually.

The third day, being very hungry, they again endeavoured to get to the place where the loaves were, near the stable, but they could not penetrate to it through the snow. They then resolved to take all possible care to feed the goats, as very fortunately over the ceiling of the stable, and just above the manger, there was an hayloft with a hole through which the hay was put down into the rack. This opening was near the sifter, who pulled down the hay and gave it to the goats as long as she could reach it, which when she could no longer do, the goats climbed upon her shoulders, and reached it themselves.

On the sixth day the boy sickened, complaining of most violent pains in the stomach, and his illness continued six days, on the last of which he desired his mother, who all this time had held him in her lap, to lay him at his length in the manger. She did so, and taking him by the hand felt it was very cold; she then put her hand to his mouth, and
finding

finding it likewise very cold, she gave him a little milk; the boy then cried, "O my father in the snow! Oh! father! father!" and then expired.

The mother told the sister the boy was dead, and then laid him in the manger near where the sister was. In the mean while the quantity of milk given by the goat diminished daily, and the fowls being dead they could no more distinguish night and day; but according to their calculation the time was near when the other goat should kid, which as they computed would happen about the middle of April; at length they found the goat was kidding by its cries: the sister helped it: they killed the kid to save the milk for their own subsistence. And now they knew it was the middle of April. Whenever they called this goat it would come and lick their faces and hands, and gave them every day two pounds of milk, for which reason they still bear a great affection to this same goat.

They say, during all this time, hunger gave them but little uneasiness, except on the first five or six days: that their greatest pain was from the extreme coldness of the melted snow water, which fell on them, from the stench of the dead asses, dead goats, fowls, from lice, &c. but more than all from the very uneasy posture they were obliged to continue in: for though the place in which they were buried was 12 English feet long, 8 wide, and 5 high, the manger in which they sat squatting against the wall, was no more than 3 feet four inches broad.

For 36 days they had no evacuation by stool after the first days: the melted snow water (which after some time they drank without doing them harm) was discharged

charged by urine. The mother said she had never slept, but the sister and daughter declare they slept as usual. The mother and sister say, that on the day they were buried their monthly evacuations were upon them, but they had not the least sign of them afterwards.

The above account was attested by the said women before the Intendant on the 16th of May, 1755.

CXII. *An Account of some of the more rare English Plants observed in Leicestershire.*

To the Earl of *Macclesfield*, President of the ROYAL SOCIETY.

My Lord,

Read Nov. 25, 1756. **I** Take the liberty, by your lordship's means, of communicating to the Royal Society an account of some of the more rare plants, growing spontaneously in Leicestershire, transmitted to me by its author, Mr. Richard Pultney, an apothecary at Leicester. Mr. Pultney is a person of real merit, well skilled not only in whatever relates to his profession, but also in various parts of Natural History. His botanical knowledge is very extensive, and he is very zealous in promoting it. He has already laid before the public, though his modesty would not permit.

permit him to subscribe his name thereto, a series of very curious and useful observations upon the vegetable poisons growing in England; the knowledge of which cannot be too much or too generally inculcated.

The plants in the work, now put into your lordship's hands, are disposed according to the sexual system of Dr. Linnæus, a very worthy member of this Society: but our author has not contented himself with a simple arrangement of the plants, the subject of his work; he has gone further, and has given us not only the synonymes of some of the best authors, but as far as his reading and observations have enabled him. their medical and œconomical uses and their places of growth.

Nothing can more tend to the advancement of the natural history of this kingdom, than that persons conversant in the various parts of it, should collect the productions of their own neighbourhood, and transmit accounts thereof to the Royal Society. How much correspondence of this kind has already done, nothing can give a stronger testimony than the Synopsis Stirpium Britannicarum of the late Mr. Ray; as this, joined to his own industry, enabled Mr. Ray to communicate to the public a more perfect account of the plants of this country than any other nation has yet seen.

I shall make no apology for troubling your lordship with this, as I am well apprised how sure every performance is to meet with your lordship's patronage, which tends to promote the ends of the institution of that Society, over which you so very worthily preside.

I have

I have the honour to be with the greatest deference
and regard,

My Lord,

Your Lordship's most obliged,

Lincolns-Inn-Fields,
Nov. 24, 1756.

and obedient Servant,

W. Watfon.

*Stirpium rariorum in agro Leicestrensi sponte
nascentium Sylloge.*

Ejusmodi *Floræ*, ita haud parvo quidem sunt subsidio incolis aliisque qui intra ejusdem regionis plagas degunt, plantasque istius terræ sibi familiares reddere gestiunt: Deinceps in illis itidem videre licet, quasnam et quam diversas quævis terra gignat producatque plantas pro ratione *Situs* atque *Soli*, unde uti Regionum, ita et plantarum mutua et haud parva differentia originem trahat sui.

Linn. Flor. Anglica.

M O N A N D R I A.

monogynia.

HIPPURIS Linn. Gener. Plantar.

Edit. 5ta. No. 11.

Hippuris. Flor. Lapp. N^o. 1 Flor. Suec. N^o. 2. Sp.
Pl. p. 4.

Limnopeuce Cord. Vaill. Raii Syn. Ed. 3. p. 136.

Haller. Helv. p. 197.

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5 K

Equisetum

Equisetum palustre brevioribus foliis polyspermon.

C. B. pin. 15. *Female Horsetail.*

In stagnant and flow-running waters and in marshy places. This elegant plant is not common in these parts. It is found in the river Soar, near Loughborough; also in a little brook near the seat of the Rev. Granville Wheler, Esquire, at West Leke Nottinghamshire.

This plant was soon discovered by the botanists, after the revival of learning, but they were at a great loss whither to refer it. Many of them took it for the *Polygonum* or *Sanguinaria fœmina* of Dioscorides: at length it fell among the *Equiseta* or *Horsetails*; till Ruppianus, Dillenius, and Vaillant, finding its parts of fructification very different from the *Horsetails*, called it by a different name, the former adopting the word *Pinnastella*, and two the latter the old name *Limnopenace*.

The flower of this plant is perhaps the most simple in all nature. It has neither Calyx nor Petal, but consists only of one Stamen and one Pistil, followed by a single seed.

D I A N D R I A

monogynia.

VERONICA Linn. Gen. Plant. N°. 25.

Veronica spicis lateralibus pedunculatis, foliis oppositis, caule procumbente Mat. Med. 11. Sp. Plant. 11.

Veronica mas supina et vulgatissima C. B. 246. Raii Syn. 281.

Male

Male Speedwell, or Fluellin, or True Paul's Betony.

On dry barren Grounds, especially upon heaths, flowering in June. Upon Charley Forest sparingly. In Garenton Park. Upon the old walls in and about Buddon Wood near Quarndon.

This is the true Veronica of the shops, which stands so well recommended by Hoffman, Boerhaave, and others, as an excellent and approved Deobstruent. What is sold for it in the shops here in the country, by the common herb-gatherers is the Veronica pratensis minor of Gerard and Parkinson, called Little or Smooth Fluellin or Paul's Betony, which is abundantly more common than the true sort. It is not long since the Veronica was a fashionable remedy for the gout, some taking it in the form of tea, and others the powder of the dried leaves.

Veronica, racemis lateralibus, pedicellis pendulis, foliis linearibus integerrimis. Flor. Suec. 9. Sp. Plant. 12.

Veronica aquatica angustifolia minor : Raii Syn. 280.

Anagallis aquatica angustifolia scutellata C. B. p. 252.

Narrow leaved Water Speedwell or Brooklime.

By the banks of ditches and on the bogs flowering in May and June. This plant is very rare in these parts; I have only seen it in a moist place in one of the closes between Loughborough and Burley Hall.

PINGUICULA Gen. Plant. Plant. 28.

Pinguicula nectario cylindraceo longitudine petali.
Fl. Lap. 11. Sp. Pl. 17.

Pinguicula Gefneri J. B. III. 546. Raii Syn. 289.
Butterwort or Yorkshire Sanicle.

In Bogs and Marshes flowering in June. In several of the moist closes about Buddon Wood.

This plant is of a purging quality, and Parkinson relates, that the poorer people in Wales make a syrup of it, which they use as a purge, Theat. Bot. p. 534. It was long since observed to be hurtful to the sheep, and it appears from the result of the experiments in the Pan Suecus of Linnæus, that neither the horses, goats, nor horned cattle will eat of it. Amæn. Acad. vol. ii. p. 238.

The plant is of great use in the Lapland Economy; see Fl. Lappon. p. 10.

T R I A N D R I A

monogynia.

SCIRPUS Gen. Plant. 62.

Scirpus culmo triquetro folioso, panícula foliosa, pedunculis nudis supra-decompositis, spicis confertis.
Fl. Suec. 38. Sp. Pl. p. 51.

Scirpus planifolius, caule triquetro, panícula foliis infidente Haller. Helv. p. 247.

Cyperus gramineus, J. B. 2. 504. Raii Syn. 426.
Millet Cyperus Grass.

In watery places about ditches, brooks, ponds, &c. flowering in July and August: Plentifully in an old pond in Sir Isaac Woolaston's park, at Loseby; and elsewhere, but not common.

ERIO-

ERIOPHORUM, Gen Pl. 63.

Eriophorum culmis teretibus, foliis planis spicatis pedunculatis. Fl. Suec. 44. Sp. Pl. 52.

Linagrostis foliis planis spicis multiplicibus Hall. Helv. p. 250.

Linagrostis, Tabern. Raii Syn. p. 435. *Cotton Grass.*

On bogs and marshes. Upon Charley Forest. In the closes about Woodhouse ; near Buddon Wood, and elsewhere.

Some of the poor people in Sweden for want of feathers fill their beds with the down of this grass, Fl. Lapon. p. 18. It seems applicable to other oeconomical uses ; as its texture is very fine, and it may in our own country be gathered in great quantities in many places.

NARDUS, Gen Pl. 65.

Nardus spica setacea recta. Fl. Suec. 47. Sp. Plant. 53.

Gramen sparteum juncifolium C. B. pin. R. Syn. 392. Hall. Helv. 203. *Small Matweed.*

On dry barren heaths, and sometimes in marshes flowering in April ; almost all over Charley Forest.

Horses and other cattle, but especially the sheep, are fond of this grass ; but it is seldom found among our hay, being too short for the scythe to reach.

Digynia.

AIRA, Gen. Pl. 75.

Aira foliis setaceis : vaginis angulatis, floribus paniculato spicatis, flosculis basi aristatis. It. Scan. 226. Sp. Pl. 65.

Gramen

Gramen parvum præcox panicula laxa canescente.

R. Syn. Ed. 2. 260. Ed. 3. 407. Tab. 22.

Fig. 2. bene. Pluk Alm 177 Tab. 33. Fig. 9. male.

On dry barren ground, especially on gravelly soil, and not uncommon upon mud walls. I have observed it in several places about Leicester and Loughborough. Upon Beacon and Bardon hills, in Charley Forest more plentifully.

It may be called small vernal grass with a loose whitish spike.

MELICA, Gen. Pl. 76.

Melica petalis imberbibus, panicula nutante simplici.

Sp. Pl. p. 66.

Gramen avenaceum nemorense glumis rarioribus ex fusco-xerampelinis R. Syn. 403.

Gr. avenaceum locustis rarioribus, C. B. p. 10.

C. Gr. avenaceum locustis rubris montanum C. B. p. 10. R. Syn. 403. Ex Sententia D. Doody, Linnæi, Halleri, Dalibard. *Red Oat Grass of the Woods.*

In Buddon Wood, and here and there upon Charley Forest, as about Swithland slate-pits. It flowers in April and May.

T E T R A N D R I A.

monogynia.

DIPSACUS, Gen. Plant. N°. 107.

Dipsacus foliis petiolatis appendiculatis. Hort. Upsal.

25. Sp. Pl. 97:

Dipsacus capitulis hæmisphæricis nudis. Hall.

Helv. p. 672.

Dipsacus

Dipsacus minor feu *Virga Pastoris* Ger. em. 1168.
R. Syn. 192. *Small Wild Teasel or Shepherd's Rod.*

On the banks of ditches about hedges especially in moist and undisturbed places, flowering in July and August.

In the lanes about Garenton Park, sparingly. In Hollinghall Wood, near Loughborough, sparingly. Plentifully about the old pond in Sir Isaac Woolaston's Park, where the *Cyperus Gramineus* grows.

ASPERULA, Gen. Plant. N°. 113.

Asperula foliis octonis lanceolatis, fasciculis florum pendunculatis. Fl. Suec. 114. Sp. Plant. 103.

Asperula Ger. 966. R. Syn. p. 224. *Herb Wood-roofe.*

In mountainous woods, and under bushes flowering in May. In Buddon, Okely, and Hollinghall Woods, near Loughborough. In the Stocking Wood near Leicester.

Dr. Gmelin in the *Petersburgh Acs*, as he is quoted by Haller *Enum. Stirp. Helv.* p. 458. observes, that the fixed salt of this plant is a stronger alkaline than any other. The plant has a very agreeable odour, and will drive away the moths. *Amæn. Acad.* Vol. I. p. 358.

PLANTAGO, Gen. Plant. N°. 133.

Plantago foliis linearibus dentatis, scapo tereti, Sp. Plant. p. 115.

Plantago foliis laciniatis *Coronopus dicta*, R. Syn. 315.

Coro-

Coronopus sylvestris hirsutior C. B. pin. 190.

On dry sandy grounds, and on heaths flowering in July. One of the hills in Charley Forest, near Sheepshead, called Ives Head, is almost covered over with it. It grows in Preswold Lanes, near Loughborough; also in a close the foot-way between Quorn and the turnpike.

From the regular manner, in which the leaves of this plant are expanded upon the ground, it has been called by some the Star of the Earth; and much has been said relating to its virtues against the bite of a mad dog. See Phil. Trans. N^o. 187. also 457.

ALCHEMILLA, Gen. Plant. N^o. 153.

Alchemilla foliis lobatis. Fl. Suec. N^o. 135. Sp. Plant. p. 123.

Alchemilla Ger. 802. R. Syn. 158. *Ladies Mantle*.

In mountainous meadows and pastures flowering in May. It is not a common plant in these parts; I have observed it upon Charley Forest, near Beacon Hill; and in the moist closes at Woodhouse, near Buddon Wood.

Dr. Haller, in his *Iter Helveticum*, attributes the extraordinary richness and plenty of the milk, in some parts of Switzerland, chiefly to this and two other plants common on their pastures; these are the narrow-leaved Plantain and the Muttelina of Gesner and Camerarius. *Opuscul Botan.* p. 178.

Digynia.

CUSCUTA, Gen. Plant. N°. 156.

Cuscuta floribus sessilibus, Sp. Plant. p. 124.

Cuscuta major C. B. pin. 219. R. Syn. p. 281.

Dodder.

It is not a common plant in these parts. It is found upon the common nettle in some of the back lanes about Leicester.

Dodder is really the same plant wherever it is found; though authors have been used to call it by as many different names as there are different plants upon which it is found. It is subject to variation in the colour of the stalks, which at first are yellowish, afterwards purple: the colour of the flower is variable too, and these accidents have been the sources of several species. M. Vaillant, though commonly averse to the multiplication of species, yet enumerates three kinds of Dodder in the *Botanicon Parisiense*, p. 43. But Linnæus, Haller, and M. Dalibard agree in referring them all to the *Cuscuta major* of Caspar Bauhine here mentioned, which is really the only species found in Europe. *Cuscuta tingit purpurascens* colore, Amæn. Acad. vol. I. 359.

P E N T A N D R I A

monogynia.

LITHOSPERMUM, Gen. Pl. N°. 166.

Lithospermum seminibus lævibus, corollis calycem vix superantibus, foliis lanceolatis. Hort. Cliff.

46. Sp. Plant. p. 132.

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Lithos-

Lithospermum feu *miliun folis* J. B. III. 590.

R. Syn. 228. *Gromwell*, *Gromil*, or *Gray-mill*.

In dry uncultivated places by the way-sides, in lanes, &c. flowering in June.

This is a scarce plant in these parts: I have only seen it on the edge of the Forest about Grace Dieu Park, and there but sparingly. The *Lithospermum arvense* or Bastard Alkanet is much more common but not so frequent as in Lincolnshire, where I have observed it among the corn about Grantham and Sleaford abundantly.

HOTTONIA, Gen. Plant. N°. 186.

Hottonia. Boerh. Ind. alt. p. 207. R. Syn. 285. Hall.

Helv. 487. Sp. Plant. p. 145.

Millefolium aquaticum f. *Viola aquatica* caule nudo

C. B. p. 141. *Water Violet*, *Water Gillower*, or *Gillflower*.

In stagnant and slow running waters and ditches flowering in April and May. Here and there in the River Soar, about Loughborough and Leicester but sparingly. It continues to grow in the places mentioned by Dr. Deering in the Catalogus Nottinghamensis.

LYSIMACHIA, Gen. Plant. N°. 188.

Lysimachia paniculata, racemis terminalibus. Sp. Plant. p. 146.

Lysimachia lutea J. B. II. 901. R. Syn. 282. *Yellow Willow Herb*, or *Loosestrife*.

In watery places about ditches and rivers, flowering in June. This is scarce in these parts. In a moist

moist place in the outwoods near Loughborough. I observed it also about a little brook by the highway on the London road, between Northampton and Newport, about four miles from Newport.

Lyfimachia foliis ovatis acutiusculis, pedunculis folio longioribus, caule repente, Sp. Plant. p. 148.

Nummularia minor flore purpurascente, C. B. p. 310. Park. 555. R. Syn. p. 283. *Purple-flowered Moneywort*.

On bogs and marshy grounds, flowering in June and July. In the boggy valleys in and about Charley Forest, and not sparingly.

The *Lyfimachia nemorum* Linnæi, or Yellow Pimpernel of the Woods, and the *Nummularia*, Moneywort, or Herb Twopence, are both more common with us than the foregoing.

The purple-flowered Moneywort is one of those plants, which is almost peculiar to England and France; hence we wonder that Linnæus has omitted it in his *Flora Anglica*.

CAMPANULA, Gen. Plant. N^o. 261.

Campanula foliis strictis: radicalibus lanceolato-ovalibus, panicula patula. Sp. Plant. 163. 4.

Campanula esculentæ facie ramis et floribus patulis Dill. Elth. 68. Tab. 58. *The rigid leaved Bell-flowers, with a diffusive panicle and patulous flowers*.

This plant is found pretty plentifully in Budon Wood near Loughborough, and especially in some of the hedges and lanes adjoining. It flowers in July and August.

Dr. Dillenius found this plant near Worcester, and took it for a Non-descript, though possibly it may be the plant, hinted at by *Merret* in his *Pinax*, under the appellation of *Rapuntium flore purpureo*. It has since been found in Sweden, though *Linnæus* makes no mention of it in any of his works before the *Species Plantarum*: elsewhere we have no intelligence of it. We have no doubt but ours is the plant described by both these authors; but if I might be allowed the conjecture, I should think it was known to *Parkinson*, and is the plant, which he describes and figures under the title of *Rapunculus nemorosus*. *Theat. Bot.* p. 649. 650. He tells us that the plant he describes under that name grows naturally wild in England; and tho' his figure is very aukward, and his description very vague, yet both answer better to our plant than to any other of the Bell-flowers, which grow spontaneously in England. *Parkinson* took his plant to be the *Rapunculus nemorosus* of *Tabernæmontanus* and the *Rapunculus campanulatus neriifolius tertius* of *Thalium*, or the *nemorosus angustifolius magno flore major* of *C. Bauhine pin.* 93. N°. 11. But *M. Vaillant*, (*Bot. Paris.* p. 27) and *Dr. Haller* (*Enum. Stirp. Helv.* p. 494.) apply all these names to the Peach-leaved Bell-flower: hence if these two able botanists are right, *Parkinson* must have been mistaken, as the Peach-leaved *Campanula*, which he describes and figures likewise in the same chapter, is not a native of England.

Whence comes it that professor *Linnæus* in the *Flora Anglica* has referred his trivial name of the
plant

plant in question to the *Rapunculus esculentus* or Common Rampions of Ray's Syn. p. 277. N^o. 4. and that he has in the same piece omitted this last plant, although he mentions it in the *Species Plantarum*, p. 164. as a native of this island?

Campanula caule angulato simplici, floribus sessilibus, capitulo terminali. Vir. cliff. 16. Sp. Pl. 166.

Campanula pratensis flore conglomerato, C.B. pin. 94. Raii Syn. 277. *Little Throatwort or Canterbury Bells.*

In mountainous places, especially in a chalky soil. It flowers in July. This plant is very scarce in this county; I have observed it about Grantham, Ancaster, and Sleaford, in Lincolnshire, very plentifully.

Campanula caule basi subramoso stricto, foliis oblongis crenatis, calycibus aggregatis corolla longioribus, capsulis prismaticis, Sp. Pl. p. 168.

Campanula arvensis erecta vel Speculum Veneris minus Ger. em. 439. Park. 1331. Raii Syn. p. 278. *The lesser Venus Looking-glass, or codded Corn Violet.*

Among the corn flowering in June and July. This I observed pretty plentifully among the corn for four or five years successively near Loughborough.

Dr. Haller takes this to be only a variety of the common Venus Looking-glass of the Gardens, and has put it down as such in the Enum. Stirp. Helv. p. 496. and though Linnæus makes it distinct, he doubts whether it be not originally sprung from the same plant.

SAMOLUS, Gen. Plant. 205.

Samolus, Hort. Cliff. 51. Fl. Suec. 165. Sp. Plant. 171.

Anagallis aquatica folio non crenato, C. B. pin. 252. *Round leaved Water Pimpernel.*

In marshes flowering in June. This is very scarce in these parts: I have seen it in the outwoods, and in Buddon Wood, near Loughborough; also upon several bogs near Charley Forest.

ATROPA Gen. Plant. N^o. 222.

Atropa caule herbaceo foliis ovatis integris. Sp. Plant. p. 181. *Bella Donna* Clus. Raii Syn. 264.

Dwale, or Deadly Nightshade.

It flowers in May. About Grace Dieu Abbey in this county, but sparingly. About North Luffenham in Rutland.

The intoxicating and poisonous quality of this herb is well known, and too many dreadful instances of its effects are to be found in various authors. See Matthioli Comment. in Dioscorid. p. 756. Edit. 1598. Gerard em. p. 341. Bodæus à stapel in Theophrast. p. 586. Wepfer Hist. Cicut. aquat. cap. 17. Boerhaave Hist. Plant. Lugd. Bat. p. 510. The memorable story of the intoxication of the Danes by the Scots, as it is related by Buchanan Rer. Scot. lib. 7. is quoted by almost all succeeding writers, when mentioning this plant. Later instances of its bad effects may be seen in the Gentleman's Magazine for August and September 1747; also in the Magazine for September 1748. See also the case of two children
and

and their father; the former of which died, and the latter narrowly escaped, by eating the berries of this plant. Hill's British Herbal, p. 329. Dr. Haller quotes several authors both antient and modern to prove its deleterious quality. Enum. Stirp. Helv. p. 507.

As pernicious, however, as this plant has generally proved, when taken unwarily, there are gentlemen in the medical way, who have dared to administer it internally in one of the most formidable diseases incident to human nature: this is nothing less than the cancer. In the year 1739, there was a thesis published at Hall in Saxony, tending to prove it a specific in the cancer. Since then it has been administered in a case of that kind with the greatest success. This case is related in a very circumstantial manner and with the greatest appearance of candor and ingenuity, in the *Bibliothèque Des Sciences et des Beaux Arts*, for the first three months of the 1755. One successful case is far from being sufficient to establish the credit of a new medicine; but the result of that case seems to render it worthy of a farther trial: and happy will it be for a miserable part of mankind, if it be hereafter attended with the same success.

RHAMNUS, Gen. Plant. N^o. 235

Rhamnus inermis, floribus monogynis hermaphroditis, foliis integerrimis. Hort. Cliff. 70. Sp. Plant. 193.

Frangula seu alnus nigra baccifera Park. 240. Raii Syn. p. 465. *The Black-berry bearing Alder.*

In moist woods flowering in April and May. In the outwoods near Loughborough plentifully. In Buddon Wood.

The inner bark of this tree, especially of the root, is a violent purge. Haller observes, that the charcoal of the wood of this tree is preferable to others for making of gunpowder. Enum. Stirp. Helv. 164. and it is used for that purpose in Sweden, Fl. Suec. p. 68. Amæn. Acad. V. I. p. 360. The berries of this tree will strike a good green, as Buckthorn berries do, and the inner bark will give a yellow dye. *ibid.*

Digynia.

GENTIANA, Gen. Plant. N^o. 285.

Gentiana corollis quinquefidis hypocrateri-formibus, fauce barbatis. Sp. Plant. p. 230.

Gentiana pratensis flore lanuginoso C. B. pin. 188.

Raii Syn. 275. *Dwarf Autumnal Gentian, or Fellwort.*

In dry mountainous pastures especially where the soil is chalky. It flowers in August. In the pastures about East Leke, Nottinghamshire, but sparingly.

The Vernal Dwarf Gentian, said, in the Synopsis, p. 275, to be found by Mr. Fitz Roberts near Kendal, is a mistake, arising from the autumnal Gentian being observed to flower sooner than common: hence it does not appear, that that plant has yet been found in England. See Wilson's Synopsis of British Plants, p. 135.

The *Gentiana perfoliata* Linnæi, or Yellow Centory, continues to grow where Dr. Deering mentions it near Nottingham.

TORDYLIUM, Gen. Plant. N^o. 293.

Tordylium umbella conferta nudiuscula: foliis pinnatis: foliolis lanceolatis inciso-ferratis. Sp. Plant. 240.

Caucalis arvensis echinata latifolia. C. B. p. 152.

Raii Syn. p. 219. *Purple-flowered great Bastard Parsley*.

I have never seen this plant in Leicestershire, but have observed it among the corn in Lincolnshire, especially about Ancaster and Sleaford.

Tordylium umbellis simplicibus sessilibus, seminibus exterioribus hispidis, Sp. Plant. p. 240.

Caucalis nodosa echinato femine, C. B. p. 153.

Raii Syn. p. 223. *Knotted Parsley*.

On the borders of fields, by the way sides, and on dry banks, flowering in June and July.

Upon the banks by the turnpike-road about Hathern. Mr. Tomlinson. Upon dry banks about Leicester.

PEUCEDANUM, Gen. Plant. N^o. 302.

Peucedanum foliolis pinnatifidis: laciniis oppositis.

Hort. Cliff. 94. Flor. Sibir. I. p. 189. Sp. Plant. p. 246.

Seseli pratense nostras. Park. Raii. Syn. p. 216. *Meadow Saxifrage*.

This plant is very plentifully found in most of our moist meadows and pastures, and not unfrequently

ly on the higher grounds. It flowers in May and June.

This plant is omitted by Linnæus in the *Flora Anglica*, although it is one of those which is found as plentifully here as in any other part of Europe.

Sium, Gen. Plant. 310.

Sium foliis pinnatis, umbella terminali. Hort. Cliff. 98.
Sp. Plant. 251.

Sium majus latifolium in summitate umbelliferum,
Raii Syn. p. 211.

Sium latifolium, C. B. pin. 154. *Great Water Parsnep.*

In and about the banks of rivers, flowering in July. In many places, in the river Soar, near Leicester, and Loughborough.

Sison, Gen. Plant. N°. 311.

Sison foliis pinnatis, umbellis erectis. Royen. Lugd. 105. Sp. Plant. p. 252.

Sium aromaticum Sison officinarum, Tourn. 308.
Raii Syn. 211 *Bastard Stone Parsley.*

In moist places about the banks of ditches, &c. flowering in July. In and about the N. E. side of Okely Wood, near Hathern. Mr. Tomlinson.

Phellandrium, Gen. Plant. N°. 315.

Phellandrium foliorum ramificationibus divaricatis,
Sp. Plant. 255.

Phellandrium vel Cicutaria aquatica, J. B. III. 183.
Raii Syn. p. 215. *Water Hemlock.*

Abundantly in the river Soar about Leicester.
This

This plant has been in great repute in Germany, and particularly Heister has given great commendations of it. It is used externally for discussing tumours of the schirrous kind, and in cataplasms for cancers and gangrenes. It has the character of being poisonous; and it has been observed, that if horses eat of it, it will occasion a paraplegia: on the other hand, the cows are fond of it, and eat it without any ill consequence. Amæn. Acad. Vol. I. p. 361. 418.

CICUTA, Gen. Plant. N^o. 316.

Cicuta umbellis folio oppositis, petiolis marginatis obtusis. Sp. Plant. 255.

Sium pinnis laciniatis, pinnulis trifidis, nervo non folioso. Hall Helv. p. 436.

Sium alterum olusatrici facie Lob. Icon. 208. Raii Syn. p. 212. *Long-leaved Water Hemlock.*

About the banks of rivers and ponds, and in marshes, flowering in July and August.

This is not common with us: I have only observed it in the pool in Nottingham park, especially at the upper end towards the rock-holes.

Many and dreadful are the instances, of the fatal effects of this plant; as not only Wepfer's treatise, but many other papers in the various periodical productions of Europe, evidently prove. Dr. Haller refers to several, Enum. Stirp. Helv. p. 436. See also the Philosophical Transactions, N^o. 480. When Linnæus was at Tornöa, upon the Lapland expedition, he discovered to the inhabitants, that the great destruction of their horned cattle, in the spring, when they were first turned out,

and when it was no uncommon thing for an hundred of them to perish, was intirely owing to this plant, which is very common in their pastures. Flor. Lappon. p. 72. The Flora Suecica confirms the same effects upon the horned cattle. p. 84. Dr. Gmelin, who observed it in the marshes almost all over Russia and Sibiria, tells us, that the people there universally affirm, that the horses eat it without any subsequent ill consequence; but that it infallibly kills the horned cattle, and that they swell very much before they die; which symptom Linnæus had remarked in those that perished at Tornoa. The inhabitants say likewise, that the root of the plant is abundantly more poisonous than the leaves. See Flora Sibirica, Vol. I. p. 203.

PIMPINELLA, Gen. Plantar. N^o. 328.

Pimpinella saxifraga major umbella candida, C. B. pin. 159.

Pimpinella saxifraga Ger. em. 1044. Raii Syn. p. 213.

Tragofelinum pinnis femilobatis, circumferratis. Hall. Helv. 428. *Great Burnet Saxifrage*.

In woods, and among bushes in shady places, flowering in July. In Hallinghall Wood near Loughborough. In Stocking Wood, and the hedges adjoining, near Leicester.

The *Pimpinella saxifraga minor* is very common with us in dry pastures, and upon banks, about hedges

Linnæus, Royen, and Ludwig, join these two species together, on supposition that they do not differ

differ essentially. Haller keeps them separate, as not having seen the effect of culture upon them. Great deference is due to the opinion of such eminent botanists, and who have had such great opportunities for observation: the difference however is very remarkable, and we have seen them in the fields keeping that difference, when growing together upon the same soil.

The root of this plant is one of the ingredients in the Pulvis Ari compositus of the shops, and is a simple much esteemed by some of the German physicians, particularly by the followers of Stahl. Very few of our herb-gatherers know this plant, but produce the root of the common Sanguisorba or Burnet, or those of meadow Saxifrage, for it.

Tetragynia.

PARNASSIA, Gen. Plant. N°. 345.

Parnassia Fl. Læp. N°. 108. Fl. Succ. 252. Hall.
Helv. 316. Sp. Plant. 273.

Parnassia vulgaris et palustris Tourn. Raii Syn.
355. *Grass of Parnassus.*

On bogs and marshes, flowering in August. In several of the marshy closes near Buddon Wood.

Pentagynia.

STATICE, Gen. Plant. N°. 348.

Statice caule nudo simplici capitato. Hort. Cliff. 115.
Sp. Plant. 272.

Statice montana minor. Tourn. 341. Raii Syn.
p. 203. *Thrift, or Sea Gilly-flower.*

It

It flowers in June and July. This is not only found in the marshes near the sea, but farther in the inland parts of the country, as I observed in Lincolnshire, where it is very plentiful about Grantham and Sleaford. I have not seen it nearer Leicester than upon a heath not far from Belvoir Castle.

HEXANDRIA.

monogynia.

NARCISSUS, Gen. Plant. N^o. 364.

Narcissus spatha uniflora: nectarii limbo campanulato erecto, petalo æquali. Sp. Plant. p. 289.

Narcissus sylvestris pallidus calyce luteo, C. B. pin. 52. R. Syn. 371. *Wild English Daffodil*.

It flowers in March, but is very rare hereabout: I have seen it by the brook-side, between the obelisk and the hall, in Garenton Park.

ALLIUM, Gen. Plant. N^o. 370.

Allium scapo nudo semicylindrico, foliis lanceolatis petiolatis, umbella fastigiata. Sp. Plant. 300.

Allium foliis radicalibus petiolatis, floribus umbellatis. Roy. Lugd. 39. Hall. Helv. p. 297. Hall. All N^o. 21. Opuscul. Bot. p. 379.

Allium sylvestre latifolium, C. B. p. 74. Raii Syn. 370. *Ramsons*.

This is not common in Leicestershire. I have seen it among some bushes by the side of a rivulet near Buddon Wood. The *Allium vineale* Linnæi, or common Crow Garlick, is likewise but rarely seen hereabout.

CONVALLARIA, Gen. Plant. N°. 383.

Convallaria scapo nudo, Flor. Lap. 113. Flor. Sibir.

P. I. p. 34. Sp. Plant. p. 314.

Lilium convallium, Ger. 331. Raii Syn. p. 264.

Lily of the Valley. Lily Convally, or May Lily.

In shady woods flowering in May. In Okely and Buddon Woods near Leicester.

Dr. Haller observes, that a beautiful and durable green colour may be prepared from the leaves of this plant with Lime. Enum. Stirp. Helv. p. 287.

ACORUS, Gen. Plant. N°. 107.

Acorus, Roy. Lugd. 6. Hall. Helv. p. 259. Fl. Sibir. I.

p. 1. Fl. Suec. 277. Sp. Pl. p. 324.

Acorus verus five Calamus Officinarum, Park. 140.

Raii Syn. 437. *True Acorus, or Sweet-smelling Flag.*

It is found in the river Soar, in several places between Kegworth and Loughborough; especially about Normanton plentifully; also near the abbey at Leicester, but very sparingly. It puts forth its catkin in May.

Trigynia.

RUMEX, Gen. Plant. N°. 407.

Rumex floribus hermaphroditis: valvulis integerrimis: unica granifera, foliis cordato lanceolatis. Hort. Cliff. 138. Sp. Pl. 335.

Lapathum folio acuto rubente, C. B. p. 115.

Raii Syn. 142. Pet. Herb. Britan. Tab. 2.

Fig. 5. *Bloodwort, or Bloody Dock.*

In .

In kitchen gardens, fallow lands, dunghills, &c. not very uncommon, flowering in July and August.

RUMEX, qui Lapathum folio acuto flore aureo, C. B. p. 115. Raii Syn. p. 142. Anthoxanthon, J. B. II. 988. Pet. Herb. Britan. Tab. ii. Fig. 8. *Golden Dock*.

In moist pastures and about ditches. In a pasture by the river-side near Hathern; Mr. Tomlinson. Also about Loughborough in several places.

TRIGLOCHIN, Gen. Pl. N°. 409.

Triglochin capsulis trilocularibus sublinearibus, Fl. Suec. 298. Sp. Plant. 338. Juncajo palustris et vulgaris. Tourn. Raii Syn. p. 435. Michel. p. 43. *Arrow-beaded Grass*.

Here and there by brook sides, and in marshy places; about Woodhouse, and elsewhere, but sparingly.

This grass is plentiful in Sweden, Russia, and Siberia, and the oxen are extremely fond of it. From the Pan Suecus it appears, that the goats, sheep, horses, and swine, will likewise all eat it.

O C T A N D R I A.

monogynia.

VACCINIUM, Gen. Plant. N°. 434.

Vaccinium pedunculis unifloris, foliis serratis ovatis deciduis, caule angulato. Fl. Lappon. 143. Hall. Helv. 415. Fl. Suec. 313. Sp. Plant. p. 349.

Vitis

Vitis Idæa angulosa, J. B. I. 520. Raii Syn. 457.
Whorts, or Whortle-Berries; Leicestrienfibis
Bill-Berries.

On heaths, and in woods flowering in April.
 In the outwoods near Loughborough, and in Bud-
 don Wood near Mountsorrel plentifully.

Bill-berries furnish the Laplanders with some of
 the greatest dainties of their table. See Fl. Lap.
 p. 108. These berries are very astringent. Haller
 refers to the Acta Bressl. Ann. 1722, for an instance
 where a decoction of them brought on such a con-
 stipation of the bowels as proved mortal. Enum.
 Stirp. Helv. p. 415.

ERICA, Gen. Plant. N°. 435.

Erica antheris bicornibus inclusis, corollis ovatis race-
mosis, foliis ternis glabris linearibus. Sp. Plant.
 p. 352.

Erica tenuifolia, Ger. 1198. Raii Syn. p. 471.
Fine-leaved Heath.

This I have observed upon Charley Forest,
 among the common heath; but more plentifully
 upon the wolds between Ashby De la Zouch and
 Burton upon Trent.

Erica antheris bicornibus inclusis, corollis subglobosis
aggregatis calyce longioribus, foliis quaternis ci-
liatis patentibus. Sp. Plant. 353.

Erica brabantica folio Coridis hirsuto quaterno.
 J. B. I. 358. R. Syn. 471. *Low Dutch Heath,*
or Besom Heath.

With the former, and more plentiful.

Dr. Plot tells us, that heath or ling is used in
 some parts of Staffordshire to malt liquor instead
 Vol. 49. 5 N of

of hops, and that it preserves it as long, without any disagreeable taste. It is a very grateful plant to the bees; and it is well known, that they procure great quantities of honey from it; but what they gather from this plant generally gives the mass a reddish colour, and is not reckoned the best honey.

DAPHNE, Gen. Plant. N^o. 436.

Daphne racemis axillaribus, foliis lanceolatis glabris.
Sp. Plant. 357.

Thymelæa floribus inter folia acuminata, levia duraque. Hall. Helv. 188.

Laureola, Ger. 1219. R. Syn. p. 465. *Spurge Laurel.*

In hedges, among bushes, and in woods flowering in March. In some hedges about Belton, near Loughborough. In the lanes about Enderby near Leicester: but is not common with us.

Trigynia.

POLYGONUM, Gen. Plant. N^o. 445.

Polygonum caule simplicissimo monostachyo, foliis ovatis in petiolum decurrentibus. Mat. Med. 189. Sp. Plant. p. 360.

Bistorta major Ger. 322. R. Syn. p. 147.

The greater Bistort or Snakeweed.

In moist meadows flowering in May. In some of the pastures and moist closes near Leicester.

Tetragynia

Tetragynia.

PARIS, Gen. Plant. N^o. 449.

Paris. Sp. Plant. p. 367.

Paris foliis quaternis. Flor. Lap. 155. Fl. Suec. 325. Hall. Helv. 412.

Herba Paris. Ger. 328. Park. 390. Raii Syn. p. 264.

Herb Paris, True Love, or One Berry.

In woods flowering in May. In Okely Wood near Hathern. Mr. Tomlinson. In Hollinghall Wood near Loughborough more plentifully. In the Stocking Wood near Leicester sparingly.

ADOXA, Gen. Plant. N^o. 450.

Adoxa, Hort. Cliff. 152. Fl. Suec. 326. Raii Syn. 267.

Moschatellina foliis Fumariæ bulbosæ, J. B. 3. 206. Raii Syn. 267.

Tuberous Moschatell, or Musk-wood Crowfoot.

Among the bushes on the south-side of Buddon Wood, but sparingly. It flowers in April.

D E C A N D R I A

digynia.

CHRYSOSPLENIUM, Gen. Plant. N^o. 493.

Chrysofplenium foliis oppositis. Sauv. Monsp. 128. Sp. Plant. 398.

Saxifraga aurea Park. 425. R. Syn. p. 158.

Golden Saxifrage.

In moist undisturbed places, about hedges, ditches, and in woods flowering in April and May.

In the outwoods near Loughborough. Also in the same place with the foregoing plant.

Pentagynia.

COTYLEDON, Gen. Plant. N^o. 512.

Cotyledon foliis cucullatis ferrato-dentatis alternis, caule ramofo, floribus erectis. Sp. Plant. p. 429.
Cotyledon vera radice tuberoſa, J. B. 3. 683. R. Syn. p. 271.

Wall Penny-wort, Kidney-wort; Leiceſtrienſibus Navel-wort.

Upon rocks and old walls flowering in May. Plentifully upon the rocks about the ſlate-pits at Swithland.

CERASTIUM, Gen. Pl. 518.

Cerastium foliis lineari-lanceolatis obtuſis glabris, corollis calyce majoribus. Flor. Suec. 381. Sp. Plant. p. 438.

Myofotis arvenſis hirsutus flore majore Tourn. Vaill. Bot. Par. T. 30. F. 4.

Caryophyllus arvenſis hirsutus flore majore, C. B. p. 210. R. Syn. 348.

Long-leaved rough Chickweed with a large flower.

On heaths and dry paſtures in a ſandy ſoil. I have never ſeen a ſingle plant of this ſpecies near Leiceſter, but have obſerved it abundantly plentiful upon the heaths in Lincolnſhire.

The *Cerastium viſcoſum* Linnæi, the ſemidecandrum, and aquaticum, are all three very common with us.

SPERGULA, Gen. Plant. N^o. 519.

Spergula foliis oppositis subulatis lævibus, caulibus simplicibus. Sp. Plant. 440.

Alfine palustris foliis tenuissimis, seu saxifraga palustris anglica. Ger. em. p. 567; 568. Raii Syn. p. 350.

English Marsh Saxifrage.

On the bogs in Charley Forest near Beacon-hill, sparingly.

D O D E C A N D R I A

trigynia.

RESEDA, Gen. Plant. N^o. 535.

Reseda foliis omnibus trifidis; inferioribus pinnatis. Hort. Cliff. p. 213. Hall. Helv. p. 315. Dalib. Par. 159. Sp. Plant. 449.

Reseda vulgaris, C. B. p. 100. R. Syn. p. 366.

Base Rocket.

About the borders of fields; and upon fallow land, in a sandy and chalky soil. This is scarce with us: I have not seen it in any part of Leicestershire where I have been, except about Waltham on the Wolds. It is plentiful about Ancaster in Lincolnshire.

I C O S A N D R I A

polygynia.

ROSA, Gen. Plant. N^o. 556.

Rosa caule petiolisque aculeatis, calycis foliolis indivisis, Fl. Suec. 407. Sp. Plant. p. 491.

Rosa

Rosa pumila spinosissima foliis *Pimpinellæ* glabris
flore albo. J. B. 2. 40. R. Syn. p. 445.

The Burnet Rose.

On sandy ground flowering in June and July.
Among the Gorse about E. and W. Leke, Not-
tinghamshire. About Kegworth and Sawley, and
elsewhere.

RUBUS, Gen. Plant. N^o. 557.

Rubus foliis quinato-pinnatis ternatisque, caulè acule-
ato, petiolis canaliculatis. Flor. Suec. 408. Sp.
Plant. p. 493.

Rubus Idæus spinosus fructu rubro. J. B. 2. 59.
R. Syn. 467.

Framboise, Hindberry; Leicestriensibus Raspberry.
In mountainous and stony places; it flowers in
May. In Buddon Wood near Mountsorrel.

The *Rubus cæsius* is not uncommon with us.

FRAGARIA, Gen. Plant. N^o. 558.

Fragaria caule decumbente repente. Roy. Lugd. 274.
Dal. Par. 147. Sp. Plant. 495.

Fragaria sterilis. C. B. p. 327. Raii Syn. p. 254.
Barren Strawberry.

In dry barren pastures, and mountainous woods.
This is very common with us; much more so than
the *Fragaria vesca* Linnæi, or Common Strawberry,
which is found in our woods but sparingly.

POTENTILLA, Gen. Plant. N^o. 559.

Potentilla foliis quinatis cuneiformibus incisfis subtus
tomentosis, caule erecto. Sp. Plant. p. 497.

Pentaphyllum erectum foliis profunde sectis subtus argenteis flore luteo. J. B. 2. 398. R. Syn.

p. 255.

Tormentil Cinquefoil.

On dry mountainous pastures, especially in a sandy soil, flowering in July. Upon the old walls about Buddon Wood near Mountsorrel. Upon Cotgrave and Stanton wolds, Nottinghamshire.

TORMENTILLA, Gen. Plant. N°. 560.

Tormentilla caule repente, Sp. Plant. p. 500.

Tormentilla reptans. Petiv. Herb. Britan. Tab.

XL1. Fig. 10. R. Syn. p. 257.

Creeping Tormentil with deeply indented leaves.

In the Radmoor closes, between Loughborough and Burley-hall.

The common *Tormentil* is so very frequently found in a *procumbent* state, that persons not much acquainted with plants, might easily mistake it for this species, without some other distinctive note: hence we wonder, that Linnaeus did not form his specific names of these two plants rather from their cauline leaves, than from their manner of growing; those of the common *Tormentil* being generally quite sessile, or close to the stalk; whereas those of this species are constantly petiolated. The former might then have been called—*Tormentilla foliis caulinis sessilibus*, and the latter—*Tormentilla foliis caulinis petiolatis*. The distinction from their manner of growing might have been added too; but it would be almost needless, and therefore contrary to our illustrious author's own rule in the *Fundamenta Botanica*, N°. 291.

P O L Y A N D R I A

pentagynia.

AQUILEGIA, Gen. Plant. N^o. 605.

Aquilegia nectariis incurvis, Hort. Upf. 150. Sp. Plant. p. 533.

Aquilegia flore simplici, J. B. III. 384. R. Syn. p. 273.

Columbines.

In woods flowering in May and June. In the outwoods near Loughborough.

D I D Y N A M I A

gymnospermia.

TEUCRIUM, Gen. Plant. N^o. 625.

Teucrium foliis cordatis serratis petiolatis, racemis lateralibus secundis, caule erecto. Sp. Plant. p. 564.

Scordium alterum seu Salvia agrestis Ger. 536. R. Syn. p. 245.

Wood Sage.

In all our neighbouring woods, and among the rocks all over Charley Forest. This is sold by many of our herb-gatherers for the true *Scordium*, to which indeed it is reckoned no bad *Succedaneum*.

NEPETA, Gen. Plant. N^o. 629.

Nepeta floribus spicatis, verticillis subpedicellatis, foliis petiolatis cordatis dentato-serratis. Sp. Plant. p. 570.

Nepeta

Nepeta major vulgaris, Park. 38. R. Syn. p. 237.
Nep., or *Cat-mint*.

On dry banks about hedges, &c. flowering in June and July. In Prestwold lanes near Loughborough. In Grooby-lane near Leicester. I observed about Grantham in Lincolnshire.

MENTHA, Gen. Plant. N^o. 633.

Mentha floribus spicatis folio oblongis serratis. Hort.
Upf. 168. Sp. Plant. p. 576. β

Menthastrum spicatum foliis longiore candicante,
J. B. Syn. 234.

Long leaved Horse-mint.

It flowers in July. I have observed this about Swithland: also at Thorp near Loughborough, and elsewhere, but not very common.

Mentha verticillata minor acuta non crispa odore
Ocymi, J. B. III. 2. 216. Raii Syn. p. 232.
N^o. 5.

Red Mint.

An. *Mentha floribus verticillatis, foliis ovatis acutis*
serratis, staminibus corolla brevioribus. Sp. Plant.
p. 577.

This is very scarce with us: I have only seen it growing in the outwoods near Loughborough, and there but sparingly.

De specie nullum certe dico, cum genere Linnaeana interim omnino convenit nostra Planta. Caulis erectus, simplex, vix pedalis: Folia longe elliptica in petiolis fere desinentibus, serrata, glabra: Flores in verticillis laxis e radice ad summum conferti: stamina corolla longiora: unde dubium, annon *Mentha gentilis* Linnæi?

THYMUS, Gen. Plant. N^o. 646.

Thymus floribus verticillatis, pedunculis unifloris, caulibus erectis, subramosis, foliis acutis serratis.

Flor. Suec. 478. Sp. Plant. p. 591.

Acinos multus. J. B. III. 2. 259. Raii Syn. p. 238.

Wild Basil.

It flowers in June. This is very scarce about Leicester. I gathered it not far from Belvoir Castle, and about Waltham on the wolds. The Clinopodium Origano simile. C. B. is frequent with us.

MELISSA, Gen. Plant. N^o. 647.

Melissa pedunculis axillaribus dichotomis folio longioribus, caule decumbente. Sp. Plant. p. 593.

Calamintha odore pulegii, Ger. em. 687. Raii Syn. p. 243.

Field Calamint.

On the borders of the fields, about the public roads, and on the banks of hedges flowering in July and August. In Prestwold lanes near Loughborough. In the Town-street near Swithland, and elsewhere.

angiospermia.

OROBANCHE, Gen. Pl. N^o. 697.

Orobanche caule simplicissimo pubescente staminibus inclusis. Sp. Plant. 632.

Orobanche major Caryophyllum olens. C. B. p. 87.

R. Syn. p. 288.

Broom Rape.

It flowers in June, among the gorse and broom about the outwoods near Loughborough; also about Thrinkston, Grace Dieu, and Sheephead.

TETRADYNAMIA.

Siculosa.

IBERIS, Gen. Plant. N^o. 721.

Iberis foliis sinuatis, caule nudo simplicis. Hort. Cliff. 328. Sp. Plant. 650.

Nasturtium petræum Tabernæm. Icon. 451. Ger. 194. R. Syn. p. 303.

The lesser Shepherd's Purse or Rock-Cress.

On dry sandy mountainous ground among rocks and stones, flowering in May. Upon the rocks at the summit of Beacon-hill, in Charley Forest; also about the slate-pits at Swithland.

Siliquosa.

CARDAMINE, Gen. Plant. N^o. 727.

Cardamine foliis pinnatis, floribus apetalis. Sp. Plant. p. 665.

Cardamine foliis pinnatis pinnis laciniatis. Hort. Cliff. 336. Hall. Helv. p. 557.

Cardamine impatiens vulgo *Sium minus impatiens*, Ger. em 260. R. Syn. p. 299.

Impatient Ladies-smock or Cuckow Flower.

It flowers in April and May. Among the rocks upon the summit of Beacon-hill; elsewhere I have not found it.

Cardamine foliis pinnatis, floribus tetandris. Hort. Cliff. 336. Sp. Pl. 655.

Cardamine impatiens altera hirsutior, R. Sym.
p. 300.

The lesser hairy impatient Cuckow Flower.

By the side of the brook at Thorp near Loughborough; and elsewhere, but sparingly.

M O N A D E L P H I A

decandria.

GERANIUM, Gen. Plant. N^o. 746.

Geranium pedunculis bifloris, calycibus pyramidatis angulatis rugosis, foliis quinquelobis rotundatis.
Fl. Suec. 575. Sp. Plant. 682.

Geranium faxatile, Ger. em. 938. Park. 707. R. Syn. p. 360.

Shining or Stone Doves-foot Cranesbill.

This is not common with us; I have observed it among the rocks upon Charley Forest, particularly about Basdon Hill.

Geranium pedunculis bifloris foliisque, ramis alternis caule ramoso, diffuso, calycibus muticis. Sp. Plant. p. 682.

Geranium columbinum majus, dissectis foliis. Ger. em. 938. R. Syn. 359.

Doves-foot Cranes-bill with jagged leaves.

Vaillant's figure, Tab. 15. Fig. 3. exactly represents our plant.

Geranium foliis ad nervum quinquefidis, pediculis brevioribus, caule erecto. Hall. Helv. p. 366. Dalib. Paris. p. 207. N^o. 5.

Haller's Description, and Vaillant's Figure, Tab. 15. Fig. 2. precisely agree with our plant,
fo

fo does Linnæus's specific name, Sp. Plant. 682. N°. 35. But as he there refers to Vaillant's fourth Figure, we cannot adopt his Synonym, those figures being greatly different from each other.

Geranium pedunculis bifloris, petalis integris longitudine calycis, caule prostrato, foliis reniformibus incis. Sp. Pl. p. 683.

Geranium folio malvæ rotundo, C. B. p. 318.

Doves-foot, or Doves-foot Cranes-bill.

These three last are all pretty frequent with us: the two former, however, are by far the most plentiful. The Geranium pratense Lin. or batrachoides, J. B. is also not uncommon.

D I A D E L P H I A

hexandria.

FUMARIA, Gen. Plant. N°. 760.

Fumaria filiquis linearibus foliis cirriferis. Sp. Plant. 701.

Fumaria alba latifolia, Park. 288. Raii Syn. p. 335.

Climbing Fumitory.

In stony places, and among rocks in a sandy soil, and sometimes about standing waters, flowering in May.

Upon the rocks in Charley Forest near Whitwick.

Decandria.

ANTHYLLIS, Gen. Plant. N°. 773.

Anthyllis herbacea foliis pinnatis inæqualibus, capitulo duplicato. Sp. Pl. 719.

Vulne-

Vulneraria foliis ad terram simplicibus ovatis, ad caulem pinnatis. Hall. Helv. 570.

Vulneraria rustica, J. B. II. 362. R. Syn. p. 325.

Kidney Vetch, or Ladies Finger.

On dry mountainous pastures, especially in a chalky soil, flowering in May and June. Plentifully about Ruddington Hills near Nottingham, and elsewhere.

This plant is subject to great variation in the colour of its flower; it is found in different places with white, yellow, red, and scarlet-coloured flowers: Linnæus thinks this variation depends in a great measure upon the difference of the soil; as he observed, that in some places, where the soil was a reddish clay, there the flowers were red. On the other hand, where the soil was a white clay, there he found the flowers white. See Fl. Suec. p. 215.

LATHYRUS, Gen. Plant. N^o. 781.

Lathyrus pedunculis multifloris, cirrhis diphyllis, foliolis ensiformibus, Hort. Cliff. 367. Sp. Plant.

733.

Lathyrus sylvestris major. C. B. pin. 344. Raii Syn. p. 319.

The other great wild Lathyrus, or everlasting Pease.

In Stocking Wood, and in a lane, leading from Belgrave to Thurcaston, near the wood-side.

Lathyrus pedunculis multifloris, cirrhis polyphyllis, stipulis lanceolatis. Hort. Cliff. 368. Sp. Plant.

733.

Vicia Lathyroides seu *Lathyrus Viciæformis*, Raii
Syn. p. 320. Fluk. Phyt. Tab. 71. F. 2.

Chickling Vetch.

In boggy, watery places. Upon some of the
bogs in Charley Forest about Bardon Hill.

HEDYSARUM, Gen. Plant. N°. 793.

*Hedysarum foliis pinnatis, leguminibus monosper-
mis aculeatis, corollarum alis brevioribus.* Sp.
Plant. 751.

Onobrychis seu *Caput Gallinaceum*, Ger. 1063.
Raii Syn. p. 327.

Medick Vetchling or Cocks-head.

This is not found with us. I have observed it
in the closes in riding between Croxton and Gran-
tham, Lincolnshire. It flowers in May and June.

TRIFOLIUM, Gen. Plant. N°. 802.

*Trifolium capitulis villosis quinquefloris, involucri
centrali reflexo rigido, fructum involvente.* Hort.
Cliff. 374. Sp. Plant. 767.

Trifolium pumilum supinum flosculis longis albis.
Phyt. Br. R. Syn. 327. Tab. 13. Fig. 2.

*Trifolium pratense supinum cathobleps seu capite
humilimerso,* Barr. Ic. 881.

Dwarf Trefoil with long white flowers.

Very common on dry sandy banks flowering in
May.

*Trifolium capitulis sessilibus ovatis, calycibus villosis
inæqualibus.* Sp. Plant. 770.

*Trifolium flosculis albis, in glomerulis oblongis as-
peris cauliculis proxime adnatis.* Raii Syn. 329.
Vaill. Bot. Paris. Tab. 33. Fig. 1.

Knotted.

Knotted Trefoil with oblong heads.

On several dry banks in St. Mary's Field, Leicester. †

Trifolium capitulis sessilibus globosis, calycibus striatis patulis æqualibus. Sp. Plant. p. 770.

Trifolium cum glomerulis ad caulinum nodos rotundis. R. Syn. p. 329.

Trifolium arvense supinum verticillatum. Bar. Ic. 882.

Knotted Trefoil with round heads.

In the closes opposite Needle's Inn, near Loughborough.

Trifolium capitulis sessilibus sublateralibus ovatis, calycibus striatis rotundatis. Sp. Plant. 770. An?

Trifolium parvum hirsutum, floribus parvis dilute purpureis, in glomerulis mollioribus et oblongis, semine magno. R. Syn. p. 329. Tab. 13. Fig. 3. optime.

Plentifully upon some lays near the fish-pool close at Loughborough.

Trifolium spicis villosis ovalibus, dentibus calycinis setaceis æqualibus. Hort. Cliff. 375. Sp. Plant. 769.

α Varietas minor ex Sententia Linnæi, quæ *Lagopus perpusillus supinus perelegans maritimus Lobelii*, Phyt. Br. Raii Syn. p. 336. Tab. 14. Fig. 2.

The least Haresfoot, or Haresfoot Trefoil.

Upon the banks of the Raw-Dikes, in St. Mary's Fields, Leicester.

P O L Y A D E L P H I A
polyandria.

HYPERICUM, Gen. Plant. N^o. 808.

Hypericum floribus trigynis, caulibus ancipitibus prostratis. Sp. Plant. 785.

Hypericum minus supinum, Park. 572. R. Syn. P. 343.

The least trailing St. John's-wort.

On heaths and barren sandy ground flowering in July. Upon Charley Forest. About Buddon Wood, and elsewhere.

Hypericum floribus trigynis; calycibus ferrato-glandulosis, foliis cordatis glabris. Sp. Plant. 786.

Hypericum pulchrum Tragi, J. B. III. 383.

Small upright St. John's-wort.

In almost all our neighbouring woods, flowering in July.

S Y N G E N E S I A
Polygamia æqualis.

LACTUCA, Gen. Plant. N^o. 814.

Lactuca foliis hastato-linearibus sessilibus, carina aculeatis. Sp. Plant. p. 796.

Chondrilla viscosa humilis, C. B. p. 130. Park. 783.

Lactuca sylvestris minima. Cat. Cant. p. 83. R. Syn. p. 162. Pet. Herb. Brit. T. 15. F. 4.

The least wild Lettuce, or Dwarf Gum-Succory.

In Hollinghall and Buddon Woods, near Loughborough. In some hollow ways and shady lanes

about Sheephead and Thrinckston. I observed it also in a hollow way at Carleton two miles from Nottingham.

HIERACIUM, Gen. Plant. N^o. 818.

Hieracium foliis linearibus subdentatis sparsis, floribus subumbellatis. Fl. Lap. 287. Flor. Sibir. II. p. 25. Sp. Plantar. p. 804.

Hieracium caule alto multifolio et multifloro, foliis firmis angustis plerumque dentatis, Hall. Helv. p. 748.

Hieracium fruticosum angustifolium majus. C. B. p. 129. Park. 801. Raii Syn. 168. Petiv. Herb. Britan. Tab. 13. Fig. 8. 10.

Narrow-leaved Bushy Hawkweed.

In almost all our woods, and among the rocks in Charley Forest, flowering in June and July.

This plant is subject to great variation, and seems to us to have been divided by many authors into several species. We have observed, that in the woods it grows more branched, having many more leaves, which are also broader, of a darker colour, and the flowers of a paler yellow, than when the plant is found upon open places. We are well assured that this is the plant mentioned by Dr. Deering in the Catalogus Nottinghamensis, for the narrow-leaved golden Lungwort, having seen it in the places referred to by him; nor have we seen any plant hereabouts which answers to the descriptions and synonymes of the *Pulmonaria gallica* or *murorum* of Linnæus.

CARDUUS, Gen. Plant. N^o. 832.

Carduus foliis sessilibus bifariam pinnatifidis, laciniis alternis erectis, calycibus globosis villosis. Hort.

Upf. 249. Sp. Plant. p. 823.

Carduus tomentosus Corona fratrum dictus. R. Syn. p. 195.

Carduus capite rotundo tomentoso. C. B. p. 382.

Woolly-headed Thistle.

This elegant plant is common with us, on mountainous ground flowering in July and August. About the Stocking Wood near Leicester. Upon the wolds about Dalby and Waltham. Upon Cotgrave Wolds, Nottinghamshire. I have observed it likewise in many places about Kettering and Rowel in Northamptonshire.

Carduus caule subunifloro, calyce inermi acuto, foliis amplexicaulibus lanceolatis ciliatis integris lacinatisque. Hort. Cliff. 392. Sp. Plant. 824.

Cirsium Anglicum, Ger. em. 1183. R. Syn. p. 193.

The English soft or gentle Thistle.

This flowers in June, and is very rare in these parts: I have seen it in some of the boggy places at Woodhouse near Buddon Wood.

Polygamia superflua.

TUSSILAGO, Gen. Plant. N^o. 856.

Tussilago thyrsis oblongo, flosculis fœmineis nudis plurimis. Hort. Cliff. 411. Sp. Plant. p. 866.

Petasites major, floribus pediculis longis insidentibus. R. Syn. 179.

Butter-Burr, with Flowers standing on long Footstalks.

It flowers in March, and is nearly as frequent with us as the common Butter-Burr. By Dixley Mill, near Loughborough, plentifully, which is the place referred to in Blackstone's Specimen Botanicum, p. 71. By the side of a brook, in the road between Ashby de la Zouch and Appleby. About Barkby, near Leicester, &c.

SOLIDAGO, Gen. Plant. N^o. 859.

Solidago caule subflexuoso angulato, racemis particulatis erectis confertis. Sp. Plant. p. 880.

Solidago caule erecto, racemis alternis erectis. Hort. Cliff. 409. Hall. Helv. 729. Flor. Sibir. II. p. 164.

Virga aurea, Ger. 348. R. Syn. p. 176.

Golden Rod.

It flowers in July and August, and is found in mountainous woody places. It is plentiful about Buddon Wood near Mountforrel.

INULA, Gen. Plant. N^o. 860.

Inula foliis undulatis amplexicaulibus, caule prostrato. Sp. Plant. p. 882.

After caule ramosissimo, foliis crispis, floribus luteis sæpe nudis. Hall. Helv. p. 727.

Conyza minor flore globoso. C. B. p. 266.

Dwarf Fleabane.

I have observed this plant here-and-there about Loughborough; but it is very scarce in these parts: and Dr. Deering told me (1749) that he had not seen it about Nottingham; though I have been informed by Mr. Watson, that it is very frequent about London.

Syn-

Syngenefia monogamia.

JASIONE, Gen. Plant. N^o. 896.

Jasione. Sp. Plant. p. 928.

Jasione foliis lineari-lanceolatis obsolete ferratis.

Hort. Cliff. 426. Hall. Helv. 496. Fl. Suec.

713. Flor. Sibir. II. p. 215.

Rapunculus Scabiosæ capitulo cæruleo. C. B. pin.

22. Park. 646. R. Syn. 278.

Hairy Sheeps Scabious, or Rampions with Scabious Heads.

Plentifully all over Charley Forest, and about Buddon Wood. It flowers in June and July.

G Y N A N D R I A

diandria.

ORCHIS, Gen. Plant. N^o. 900.

Orchis bulbis indivisis, nectarii labio lanceolato integerrimo, cornu longissimo, petalis patentibus.

Fl. Suec. 723. Mat. Med. 411. Sp. Plant. 939.

a. I. Varietas amplioribus foliis ex Hall. Helv. 266.

v. Fl. Sibir. I. p. 16. II. quæ Orchis hermaphrodita bifolia, J. B. II. 772. Raii Syn. p. 380.

17.

Butterfly Satyrion.

In Hallinghall Wood near Loughborough: flowering in May.

b. II. Varietas statura minore, ex iisdem quæ

Orchis alba bifolia minor calcar oblongo. C. B.

p. 83. Raii Syn. 380. 18. Vaillant. Bot. Par.

p. 151. Tab. 30. Fig 7.

The lesser Butterfly Orchis.

Sparingly in some inclosures near Buddon Wood.

OPHRYS, Gén. Plant. N^o. 902.

Ophrys bulbis aggregatis oblongis, caule subfoliofo, floribus secundis, Nectarii labio indiviso. Aët. Upf. 1740. p. 32. Dalib. Par. 277. Sp. Plant. p. 944.

Orchistraum, 1. 2. Michel. N. Pl. G. p. 30. Tab. 26.

Helleborine radicibus conicis simplicibus. Hall. Helv. p. 274.

Orchis spiralis alba odorata, J. B. Raii Syn. 378.

Triple Ladies Traces.

It flowers in Autumn. This I have observed in some of the closes about Buddon Wood; also in a close near E. Leke, Nottinghamshire, where the *Gentiana*, *Amarella* Linnæi, grows; but it is very scarce.

Ophrys bulbo fibroso, caule bifolio, foliis ovatis, Nectarii labio bifido. Sp. Plant. p. 946.

Ophrys foliis ovatis. Hort. Cliff. 429. Hall. Helv. p. 277. Fl. Sibir. I. p. 25.

Bifolium majus seu Ophrys major quibusdam, J. B. Raii Syn. p. 385.

In woods and meadows flowering in May, but not very common with us. In Hollinghall Wood, near Loughborough, plentifully.

SERAPIAS, Gen. Plant. N°. 903.

Serapias bulbis fibrosis, nectarii labio obtuso crenato petalis brevioribus. Fl. Suec. 734. Dalib. Par. 276. Sp. Plant. 949.

a. Serapias caule multifolio multiflora. Hort. Cliff. 429. Fl. Sib. I. p. 8.

Helleborine latifolia montana, C. B. p. 186. R. Syn. p. 383.

The most common Bastard Hellebore.

In woods flowering in June. In the most northern part of Buddon Wood. In an inclosure adjoining to Beaumanor coppice near Loughborough.

b. Helleborine palustris nostras. Raii Syn. p. 384. *Marsh Hellebore.*

In marshes and boggy grounds flowering in June. Plentifully in the moist closes between Woodhouse and Buddon Wood. Upon Charley Forest.

M O N O E C I A.

polyandria.

CERATOPHYLLUM, Gen. Plant. N°. 944.

Ceratophyllum, Hort. Cliff. 446. Fl. Suec. 783. Sp. Plant. 992.

β. Hydroceratophyllum folio lævi octo cornibus armato. Vaill. Raii Syn. 135.

Horsetail Water Milfoil.

In ditches and ponds, but not common with us. I have observed it about Loughborough, and always the variety with smooth leaves much divided.

The

The *Myriophyllum spicatum* is much more common.

POTERIUM, Gen. Plant. N^o. 948.

Poterium inerme, caulibus subangulosis, Hort. Cliff.
446. Sp. Plant. p. 994.

Sanguisorba minor, J. B. III. 2. 113. Raii Syn.
p. 203.

Small Burnet.

On dry mountainous pastures, especially in a chalky soil; flowering in June. About Ruddington hills near Nottingham. Upon the banks of the Raw-dikes near Leicester. It is abundantly plentiful on all the heaths about Grantham, Ancaster, and Sleaford, in Lincolnshire.

D I O E C I A

diandria.

SALIX, Gen. Plant. N^o. 976.

Salix humilis latifolia et alpina repens, Park. 1432.
Fig. 1433. bene.

Salix alpina pumila rotundifolia repens inferne subcinerea, C. B. R. Syn. p. 448? An.

Dwarf broad-leaved creeping Willow.

Upon Charley Forest, about Beacon and Bardon hills, but not very plentifully.

Among the Linnæan species, the *Salix fusca*. Sp. Plant. 1020. n^o. 24. seems to answer the nearest to our plant; but as that species is omitted in the *Flora Anglica*; we could not with propriety adopt his synonym: The figure of the leaf is likewise better represented by Fig. 1. Pl. Lapp,

Tab. 8. than by any other. Haller's description of his *Salix foliis lævibus, ovatis, spica rarissima*, both in the *Enum. Stirp. Helv.* p. 154. and in the *Iter Helveticum Opusc. Bot.* p. 301, 302. answers tolerably to our plant. Sed omnes fere *Salicum* Species difficillime extricantur.

P O L Y G A M I A

monoecia.

VALANTIA, Gen. Plant. N°. 1019.

*Valantia floribus masculis quadrifidis, pedunculis di-
phyllis*, Hort. Ups. 303. Sp. Plant. 1052.

Galium foliis quaternis, flosculis in alis confertis.
Hort. Cliff. 34. Hall. Helv. 462.

Cruciata, Ger. 965. R. Syn. p. 223.

Crosswort or Mugweed.

About hedges and bushes flowering in May and June. This Plant, which I find is but rare in some parts of England; grows very common with us almost every where.

C R Y P T O G A M I A

Filices.

OPHIOGLOSSUM, Gen. Plant. N°. 1035.

Ophioglossum fronde ovata, Fl. Suec. 839. Sp. Plant. p. 1062.

Ophioglossum, J. B. III. 708. Raii Syn. p. 128.
Hall. Helv. p. 131.

Adder's Tongue.

In moist woods, meadows, and pastures flowering in May. In and about Hallinghall wood near

Loughborough and elfewhere, but not plentifully.

OSMUNDA, Gen. Plant. N^o. 1036.

Osmunda scapo caulino solitario, fronde pinnata folitaria. Fl. Suec. 842. Sp. Plant. 1064.

Lunaria minor, Ger. 328. Raii Syn. p. 128. Barrel. Icon. 252. N^o. 3. bona.

Moonwort.

In the closes between Okely Wood and Whatton, near Loughborough. In the meadows near Swarfton bridge. Found also near Harborough.

Osmunda fronde bipinnata apice racemifera. Sp. Plant. 1065.

Filix ramosa non dentata florida. C. B. p. 307. Raii Syn. 125.

Water Fern or flowering Fern, or Osmund Royal.

In moist woods, boggy grounds, and marshes, flowering in June and July. About Grace Dieu Abbey. Mr. Tomlinson.

Osmunda frondibus lanceolatis pinnatifidis: laciniis confluentibus integerrimis parallelis. Sp. Plant. 1066.

Struthiopteris. Hall. Helv. 132.

Lonchitis aspera minor. C. B. p. 329. Raii Syn. 118.

Rough Spleenwort.

This elegant Plant is plentiful in the outwoods near Loughborough, and in Buddon wood, near Mountsorrel.

ASPLENIUM, Gen. Plant. N^o. 1042.

Asplenium frondibus pinnatis; pinnis subrotundis crenatis. Fl. Lap. 388. Hall. Helv. 135. Sp. Plant. p. 1080.

a. Trichomanes five Polytrichum Officinatum, C. B. 356. Raii Syn. 119.

English black Maidenhair.

Upon an old wall in Normanton Town, near Loughborough.

b. Asplenium pinnis laciniatis. Hall. Helv. p. 136. *Trichomanes foliis eleganter incis.* Tourn. Raii Syn. p. 120.

I find a specimen of this variety among my dried plants, which I think was gathered upon the rocks on Beacon hill, in Charley Forest. It corresponds exactly to Pluknet's Icon. Phyt. Tab. 73. Fig. 6.

The *Adiantum nigrum Officinatum*, J. B. R. Syn. 126, is pretty frequent with us in woods and shady lanes at the roots of trees about rocks and old stone walls: This species is frequently sold by the herb-gatherers for the *Trichomanes* abovementioned: the mistake however is of little consequence, as without doubt both species are nearly of the same quality.

POLYPODIUM, Gen. Plant. N^o. 1043.

Polypodium fronde bipinnata: pinnis lunulatis dentatis, stipite strigoso. Roy. Lugd. 500. Dal. Par. 314. Sp. Plant. 1090.

Filix mas non ramosa pinnulis latis auriculatis spinosis. Ger. em. 1130. R. Syn. 121. Pluk. Phyt. Tab. 179. Fig. 6. optime etiam Tab. 180. Fig. 3.

In the outwoods, and in Hollinghall wood, near Loughborough and elsewhere, but not very common.

Musci.

England is noted above all other countries for producing a great variety of mosses; we have distinguished at least an hundred different species, which are all very common with us; but it would be inconsistent with our design to introduce many of them here: a few which are but rarely met with we shall mention.

BRYUM, Gen. Plant. N^o. 1057.

Bryum antheris erectiusculis: operculo arcuato, foliis erectis imbricatis, furculis ramosis. Sp. Plant. 1118.

Bryum trichoides, erectis capitulis, albidum fragile. C. Giff. 225. R. Syn. p. 97, 29. Hall. Helv. p. 114. 28. Vaillant Bot. Par. Tab. 26. Fig. 13.

I have observed this moss upon Charley Forest amongst the *Sphagnum palustre* Linnæi, which is much more frequent.

JUNGERMANNIA, Gen. Plant. N^o. 1059.

Jungermannia acaulis fronde lineari: ramosa; extremitatibus furcatis obtusiusculis. Fl. Suec. 928. Sp. Plant. 1136.

Ulva saxatilis, furcata, latiusculis et tenerioribus segmentis. R. Syn. 63.

Hepatica

Hepatica arborea globuligera Vaill. Par. 98. T. 23.
F. 11.

Marfilea minima Michel. N. Pl. Gen. p. 5. N. 4.
Tab. 4. F. 4. Hall. Helv. p. 127.

About the roots of trees among other mosses,
but it is not plentiful with us.

ANTHOCEROS, Gen. Plant. N°. 1065.

Anthoceros frondibus indivisis sinuatis lævibus. Sp.
Plant. p. 1139.

Anthoceros major Michel. N. Pl. Gen. p. 11. T.
7. F. 1. Hall. Helv. p. 127.

Lichenastrum gramineo pediculo, et capitulo, ob-
longo, bifurco. R. Syn. p. 105.

This I have found upon the banks of brooks,
and ditches in several places, but it is not com-
mon. It is in heads in April.

LICHEN, Gen. Plant. N°. 1065.

Lichen foliaceus laciniatus obtusus glaber ; supra la-
cunofus ; subtus tomentosus. Fl. Suec. 960. Sp.
Plant. p. 1145.

Lichenoides peltatum arboreum maximum, C.
Giff. 208. R. Syn. p. 76.

Lichen pulmonarius arboreus five *Pulmonaria ar-*
borea, J. B. Michel. N. Pl. G. p. 86. Ord. 15.
Tab. 45; omnino. Hall. Helv. p. 73. 56.

Lungwort, Oak Lungs.

In Buddon wood about the roots of trees, and
upon the rocks ; but it is not so plentiful as many
other species belonging to the Genus. The *Lichen*
terrestris cinereus Raii, is very common on all our
dry pastures.

Lichen

Lichen fruticulosus solidus tectus foliolis crustaceis.

Fl. Suec. 982. Sp. Plant. 1153.

Lichenoides non tubulosum cinereum ramosum totum crustaceum. R. Syn. 66. N^o. 11. forte etiam N^o. 12. ejusdem.

Lichen cinereus fruticosus, &c. Michel. p. 78.

Tab. 53. Fig. 5, 6.

In many places upon Charley Forest, and in Buddon Wood particularly.

Lichen fruticulosus solidus ramulis teretibus obtusis.

Fl. Suec. 983. Sp. Plant. 1154? An.

Lichenoides non tubulosum ramosissimum fruticuli specie rufo nigrescens. C. Giff. 202. Raii Syn. 66.

Lichen terrestris augustior ramosissimus fuscus

Vaill. Bot. Par. p. 115. Michel. p. 78. N^o. 17.

Hall. Helv. p. 70.

Small brown Coralline Moss.

Upon the highest rocks, on Beacon and Bardon hills, in Charley Forest.

Lichen filamentosus ramosissimus decumbens impli-

catus opacus. Fl. Suec. 987. Sp. Pl. p. 1155.

N^o. 74?

Muscus corallinus saxatilis faeniculaceus, M. P. 78.

R. Syn. 65. N^o. 7. forte etiam, N^o. 3. ejusdem.

Rock Hair.

This continues to grow upon the rocks in Charley Forest, as intimated in the Synopsis, where it was first found: particularly upon the summit of
the

the highest rocks upon Beacon hill. Also upon the rocks near Thrinkston.

The Lichen *hirtus*, and *floridus* Linnæi are both found in our Woods.

Several of the mosses belonging to this extensive Genus enter into oeconomical and medicinal uses; in the latter province the Cup-moss and the Horned moss have been celebrated in inveterate coughs, especially the former in the chincough of Children; and Lungwort has been no less famous in Consumptions. The present practice, however, regards them but very little, except the ash-coloured ground Liverwort introduced into practice by Dr. Mead. Their oeconomical uses are much more extensive: The orcella forms a branch of trade on account of its use in dying: but it is not the only species that is capable of being applied that way; there are others, which will tinge a purple and yellow colour: and it is to be wished that experiments were made with some of them for that purpose, as they are so plentifully found in our own nation. The common coralline moss is the principal food of the Rein-Deer, in winter, in the northern countries of Lapland, and even with this alone will they frequently become fat. We have hints of several other oeconomical uses of this tribe of plants in the *Flora Oeconomica*, Amæn. Acad. Vol. I. taken from Linnæus's *Itinera*; which books we are deprived of the pleasure of reading on account of their being wrote in the Swedish tongue. Amidst the great variety of books much less useful and entertaining, it is greatly to be regretted that they are not likewise translated into a language more universally known.

TREMELLA, Gen. Plant. N°. 1067.

Tremella plicata undulata. Fl. Suec. 1018. Sp. Plant.
1157.

Ulva terrestris pinguis et fugax. Raii Syn. p. 64.

Collema finuosa fugax. Hill. Hist. Plant. p. 84.

This is not very common with us, I have observed it after rain in the pastures, especially about hedges. Our country people call it Tar-slough and some of them, as it is principally seen after rain, suppose, as they do in Sweden, that it drops from the clouds.

ULVA, Gen. Plant. N°. 1067.

Ulva tubulosa simplex, Fl. Lappon. 458. Sp. Plant.
1163.

Ulva marina tubulosa intestinorum figuram referens. R. Syn. p. 62.

Linkia palustris intestini forma tubulosa. Hall.
Helv. p. 62.

Very plentifully in the river Soar about Leicester and Loughborough.

Fungi.

FUNGUS. Michel. Nov. Plant. Gen. p. 133. Hall.
Helv. p. 34. Amanita Dillen. Cat. Giffens. p.
177. Agarici stipitati Linnæi.

Fungus piperatus albus lacteo fucco turgens. J. B.
R. Syn. p. 4. Hall. Helv. p. 34. Michel. p.
141.

Pepper Mushroom.

Plentifully

Plentifully in the outwoods near Loughborough, and in Buddon Wood, near Mountforrel, where I have frequently seen them answering to the size and shape of Vaillant's variety, which he calls *Fungus lacteus maximus infundibuli forma*, Bot. Par. p. 61. N^o 8.

Fungus minimus totus albus, pileolo hemisphærico utrique striato, lamellis rarioribus, Michel. p. 166. N^o. 3. Tab. 80. Fig. 11. optime. Hall. Helv. p. 36.

Fungus parvus candidissimus, &c. R. Syn. p. 9. N^o. 46. etiam N^o. 45. ex Dillen.

This small elegant Fungus I have observed arising from the putrid leaves, in hedge bottoms and in woods. It is exactly represented by Micheli's Figure, and answers to Vaillant's and Haller's descriptions.

SUILLUS.

Michel. Nov. Pl. Gen. p. 126. Hall. Helv. p. 29.
Boleti stipitati Linnæi.

Suillus fulvus inferne ex flavo virescens. Hall. Helv. p. 29.

Boletus bovinus, Lin. Sp. Plant. 1177.

Fungus porosus crassus, R. Syn. p. 11.

Abundantly in the outwoods near Loughborough. Also in Buddon Wood, near Mountforrel.

This is of the esculent kind: and Micheli tells us it is sold amongst others in the Italian markets. The cows will eat it; but it renders their milk very nauseous. Fl. Oeconom.

POLYPORUS.

Michel. Nov. Pl. Gen. p. 129. Hall. Helv. p. 25.

Polyporus exiguus coriaceus albus lignis adnascens.

Michel. p. 130. Tab. 70. Fig. 7.

Boletus albicans, poris tenuissimis. Deering Cat. Nottingham. 86.

This I found upon the stumps of trees; but it is not common with us. Dr. Deering communicated it to the late eminent Professor at Oxford, who returned it to him with the above name, as a non-descript.

HYDNUM, Gen. Pl. N^o. 1076.

Erinaceus, Michel. Nov. Pl. Gen. p. 132.

Hall. Helv. p. 31.

Hydnum stipitatum pileo convexo imbricato. Fl.

Lap. 523. Sp. Pl. p. 1178.

Erinaceus esculentus albus crassus, Michel. 131.

Tab. 72. Fig. 2. Hall. Helv. 31.

Fungus pæne candidus pronâ parte erinaceus, J. B. R. Syn. p. 11.

This I have sometimes observed about Leicester; but it is very rare.

ELVELA, Gen. Pl. N^o. 1078.

Fungoidis Ordo I. Michel. p. 204.

Elvela pileo deflexo adnato lobato difformi, Fl.

Succ. 1103. Sp. Pl. p. 1180.

Fungoides fungiforme crispum laciniatum et varie complicatum, pediculo crasso striato rimoso ac fistuloso, Michel. 204. Tab. 86. Fig. 7.

Boletus petiolo rugoso pileolo latissimo, Hall. Helv. p. 23.

Fungus terrestris pediculo striato et cavernoso capitulo plicatili subtus plano, R. Syn. p. 39. N^o. 23.

This is not common with us. I observed it for three years successively on the grass walks at Burley Hall, near Loughborough.

ÆCIDIUM, Hill. Hist. Plant. p. 64.

Lichen agaricorum, Ordo II. Michel. p. 104.

Hall. Helv. p. 90.

Æcidium tuberosum reniforme, Hill. Hist. Pl. p. 64.

Lichen agaricus crustaceus crassus, bovellum quasi renem representans niger, et veluti deustus, Michel. p. 104. Tab. 54. Fig. 1. Hall. Helv. p. 90. N^o. 6.

Found upon the old trees near Enderby, by John Lewin. I have also observed it upon the trees about Belton, near Loughborough.

It is found also about Nottingham; and in its younger state is what Dr. Deering calls *Agaricus niger globosus nonnihil compressus intus albissimus substantiæ tenacis et ligamentosæ*, Cat. Nottingham. p. 11. This I am convinced of from seeing some specimens of it in the Doctor's possession. Upon old ash trees about Winwick, Northamptonshire. Mr. Farmer.

Æcidium, quod Lichen Agaricus bullatus parvus ex obscuro-nigricans, sub cute arborum exsiccatarum erumpens, Michel. p. 105. Tab. 54. Fig. 2. Hall. Helv. p. 91.

This I have frequently observed upon rotten sticks in moist places.

AGARICUS, Dillen. Cat. Giff. p. 191. Ra. Syn.
p. 21. Hall. Helv. p. 59.

Agaricum, Michel. p. 117.

Agaricus superne villosus et versicolor, inferne corrugatus et violaceus, Hall. Helv. 59.

Agaricus mesentericus violacei coloris, Cat. Giff. 194. R. Syn. p. 22.

Agaricum squamosum et lichenosum, &c. Michel. p. 124. N^o. 5. Tab. 66. Fig. 4.

Agaricus membranaceus sinuosus substantiæ gelatinæ, Cat. Giff. p. 194. R. Syn. p. 21.

Nostoc luteum mesenterii forma Vaill. Bot. Par. Tab. 14: Fig. 4. bene.

Both these I have observed upon rotten wood ; but they are not common.

CLAVARIA, Michel. Nov. Pl. Gen. N^o. 208.

Hall. Helv. p. 14. Hill. Hist. Pl. p. 59.

Clavaria lutea minima, Michel. p. 208. N^o. 9. Tab. 87. Fig. 5.

Fungoides clavatum minus, Cat. Giff. 189. Raii. Syn. p. 14.

Clavaria vermiculata fistulosa candida, Michel. p. 209. Tab. 87. Fig. 13. Hall. Helv. p. 14.

Fungoides clavatum compressum summitatibus luteis. Dr. Deering Cat. Nott. 75.

These I have sometimes observed in our pastures ; but they are not very common.

CORALLOIDES. Michel. Nov. Pl. Gen. p. 209.

Hall. Helv. p. 14.

Coralloides flava, ramis expansis obtusis. Hall. Helv. p. 15.

Corallo.

Corallo Fungus flavus, Vaill. Bot. Par. p. 41.
Tab. 8 Fig. 4. bene.

Fungus parvus luteus ramosus, Raii Syn. p. 16.
In the pastures about Loughborough.

Coralloides, quod Fungus ramosus minor, colore for-
dide flavicante. Raii Syn. 16.

In the pastures about Woodhouse, near Lough-
borough.

XYLARIA, Hill. Hist. Pl. p. 62.

Lichen-Agaricorum, Ordo I. Michel. p. 104.
Hall. Helv. p. 89.

Xylaria compressa extremitatibus divaricatis, Hill.
Hist. Pl. p. 62.

Clavaria ramosa cornuta compressa, Fl. Suec. 1105.
Sp. Plant. 1182.

Lichen-Agaricus nigricans ligno adnascens, ple-
rumque multifidus et compressus ima parte vil-
losus, superna vero glaber albidus et pulveru-
lentus. Michel. p. 104. Tab. 55. Fig. 1. optime.
Hall. Helv. p. 89.

Fungus ramosus niger compressus parvus, apici-
bus albidis, R. Syn. 15.

About rotten wood, especially the ash, not very
uncommon. Dr. Haller supposes that the Fungus
niger compressus varie divaricatus et implexus in-
ter lignum et corticem, R. Syn. 15. N°. 9. is
only the root of the above Fungus spreading itself,
in a reticulated manner, between the bark and the
wood. We have frequently observed this reticu-
lated Fungus about Leicester. It is exactly repre-
sented by Micheli, Tab. 66. Fig. 3. who has
brought it among the Agarics.

GEASTER.

GEASTER.

Michel. Nov. Pl. Gen. p. 220. Hall. Helv. p. 13.
 Geaster medius, radiis plerumquem ultifidis, umbilico
 seu ore stellato, Michel. p. 220. Tab. 100. Fig. 5.
 Lycoperdon volva stellata, radiis multifidis, osculo
 stellato, Hill. Hist. Plant. p. 51.

Geaster volvæ radiis et operculo elevatis. D. Watson.
 Act. Phil. N°. 474.

Lycoperdon volva stellata radiis fissilibus. Hill.
 Hist. Pl. p. 52.

Fungus pulverulentus Turriculam referens. D.
 Rand. Blacks. Specim. Botan. p. 24. Tab. 2.

These two elegant Fungi were both found at Ha-
 thern, near Loughborough. Mr. Tomlinson. They
 were both observed for some years successively.

CXII. *A Letter from Mr. John Ellis, F. R. S.
 to Philip Carteret Webb, Esq; F. R. S.
 attempting to ascertain the Tree that yields
 the common Varnish used in China and Ja-
 pan; to promote its Propagation in our
 American Colonies; and to set right some
 Mistakes Botanists appear to have enter-
 tained concerning it.*

Dear Sir,

Read Nov. 25,
 1756.

AS I had a favourable opportunity
 this summer, from my situation
 opposite to Mr. Christopher Gray's nursery garden
 at

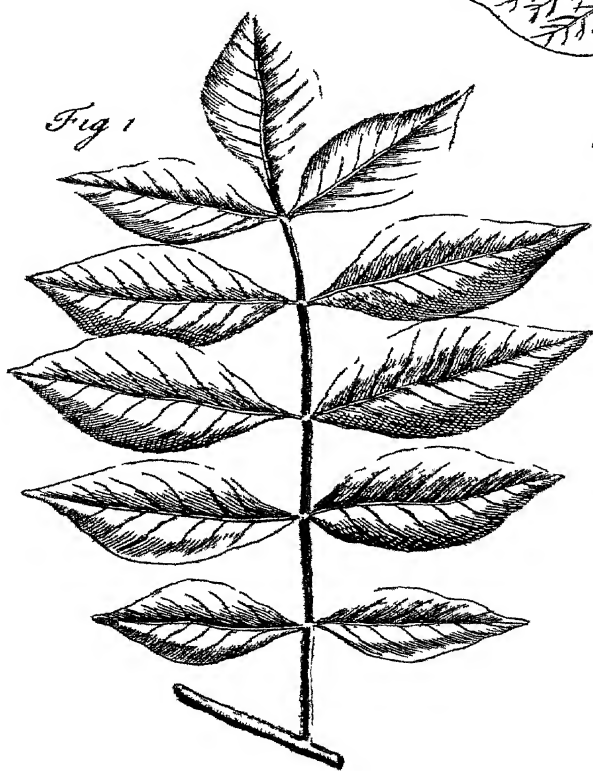


Fig. 1

*Arbor Americana alatis foliis succo lacteo
venenata. Pluknet. Phyt. Tab. 145 Fig. 1.*

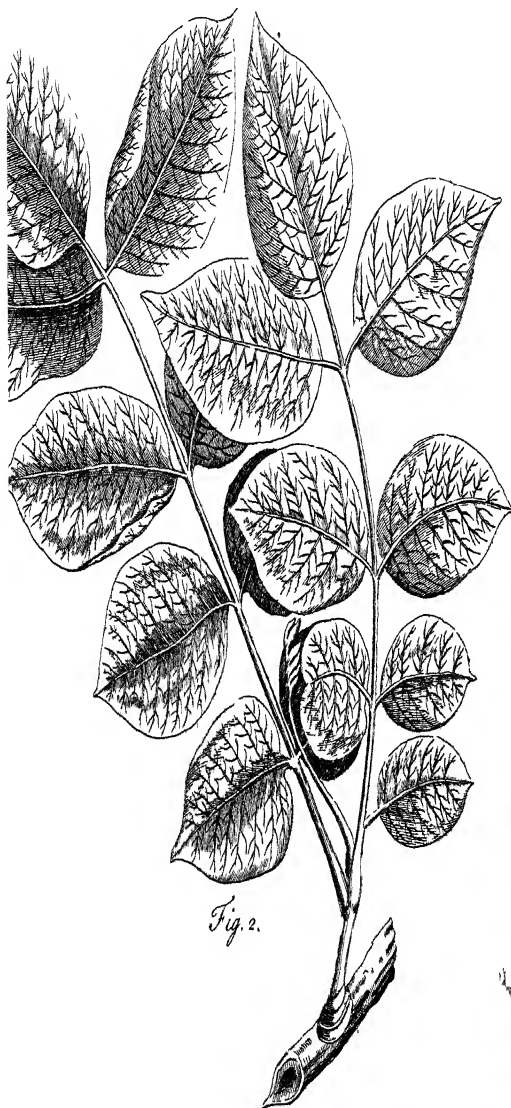


Fig. 2.

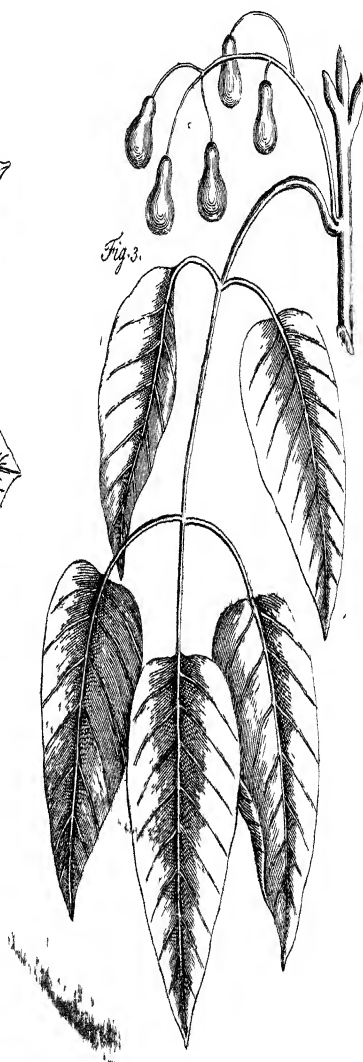


Fig. 3.

Sitz vel Sitz dju, vulgo Uru, seu Uru no ki.
Arbor vernicifera legitima folio pinnato Juglandis fructu racemose Cistaceae fructu.
Kempferi Amantitatis p. 791.

Toxicodendron folio alatis, fructu purpureo
purpureo speculo. Catalogi N. Hist. Vol. 1. p. 40.
J. Nymphae

at Fulham, to examine his curious collection of exotic plants, I began with the *Rhus*, or *Toxicodendron*, in order to the clearing up some points disputed in two letters, lately published in the last volume of our *Transactions*, N°. 49, part I. p. 157 to 166. One from the Abbé Mazeas to Dr. Stephen Hales, on the discovery of the juice of certain species of *Toxicodendron* staining linen of a fine black colour, and the other in answer to it from Mr. Philip Miller, of Chelsea, insisting that it was not a new discovery.

In order to be satisfied of the fact ; I made several experiments on the three species of *Toxicodendrons* mentioned by the Abbé Mazeas ; and find, that the juices of them do stain black, and if fixed by allum are not to be washed out by soap, or boiling in a lee of pot-ashes : but the pinnated one called by the gardeners the poison ash, did not strike so deep a black as the other two trifoliate ones, being more of a rusty colour.

I went now upon the enquiry to compare, and see, whether in reality this pinnated *Toxicodendron* of our North American settlements, is the true varnish tree of Japan, as asserted by Mr. Miller ; and first I found it necessary to know, where this poison tree was described. This I was led to by Mr. Miller's letter, where he says, the poisonous quality is described in the *Philosophical Transactions*, N°. 367. p. 145 and 146, and a very exact (1) figure of a leaf of it therein referred to in Plukenet's *Phytographia*, Tab. 145. Fig. 1.

In order to know what Dr. Kæmpfer has said of this matter, whose words Mr. Miller seems to depend on, I carefully translated his description both of the (2) true Varnish tree, and the (3) spurious one; and find, that his description of the true varnish tree, or Sitz, does not agree with this *Toxicodendron*, which Mr. Miller supposes to be the same; for the leaf-stalk or midrib of this, that supports the pinnæ or lobe leaves, as well as the under part of the leaves, are quite smooth; which is one specific character, that every botanist and gardener knows is necessary to be observed in the proper classing the various species of this genus of plants; many of them being smooth, and many of them downy: whereas Dr. Kæmpfer, speaking of the midrib of his true Varnish tree, calls it, "*leviter lanuginoso*," which may be translated, somewhat downy: and when he describes the under part of the leaves, he says, "*dorso incano et molliter lanuginoso*," that is, the under part hoary and covered with a soft down.

How far the bottom or lower part of each lobe or small leaf answers to the drawing he has given of it, I shall leave to the curious botanist; for he says it is, "*basi inequaliter rotundâ*," that is, having some inequality in the roundness of its base: whereas the lobe leaves of our American pinnated *Toxicodendron* come to a point at their footstalks, nearly equal to that at top; as may be seen in Plukenet's figure (4), which I have copied exactly. I have likewise copied minutely, for your inspection, Dr. Kæmpfer's figure

(2) See Fig. 2. Tab. 24.
 (4) See Fig. 1. Tab. 24.

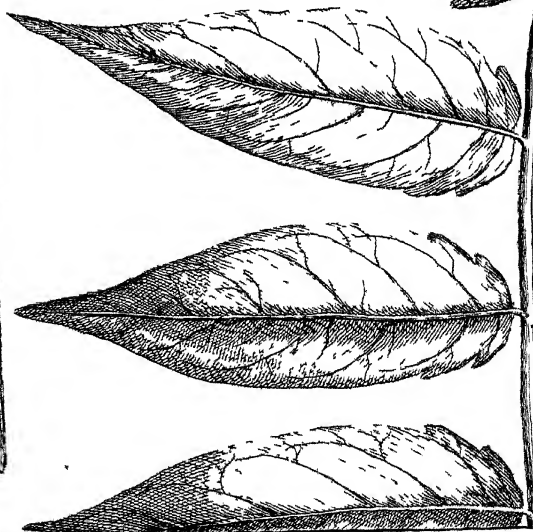
(3) See Fig. 4. Tab. 25.

*Rhus Linnæi folus alatis, foliolis oblongis
acuminatis ad basin subrotundis & dentatis*

Fig 5



The Remainder of the Stalk



A Leaf of the Naruth Tree from Nankin in CHINA
 raised from seed by Mr. Webb & Mr. Willer
 which Father D'Incarville sent to
 the Royal Society
 about the Year
 1751.

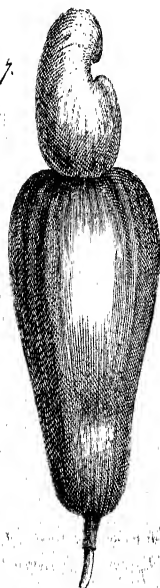
Philos. Trans. Vol. XLIX. TAB. XXV. p. 868.

Fig. 6.



The Marking Nut of India or
Anacardium Officinale, call'd by LINNÆUS *Arceuthia*.
 commonly call'd the Malacca Bean.

Fig. 7.



The Cashew Nut sitting on its fleshy Fruit.
Argemone of Tournefort. *Arceuthia* of LINNÆUS.

Fig. 4.



Fig. 8.



The Official *Anacardium*
 sitting on its fruit.

Esli no li Arceuthia spinosa Symplocos
Angustifolia. *Komfortia Amomites* P. 794

J. M. de la.

of his true Varnish-tree, on the same paper with the other (5).

Dr. Dillenius, late professor of botany at Oxford, has omitted these necessary characters in his description of the true Japan Varnish-tree from Dr. Kämpfer in his *Hortus Elthamensis*, where he gives it as a synonym for this American pinnated *Toxicodendron*: whereas had he been exact in the description given it by his author, he must evidently have made it another species. This has misled the accurate Linnæus, who quotes Dillenius's Synonyms for Kämpfer's *Arbor Vernicifera*, or *Sitz''dsju*.

As another synonym, and in proof of our Poison ash or winged-leaf *Toxicodendron* being the true Japan Varnish-tree, Mr. Miller says in his letter, that Mr. Catesby has given a very good figure of it, in his *Natural History of Carolina*, Vol. i. page 40, where he calls it (6) *Toxicodendron foliis alatis, fructu purpureo pyriformi sparso*; but as the bare inspection into Catesby's figure of this tree will convince the curious enquirer, whether botanist or no, that it cannot be the Poison ash, known to the gardeners, I shall only mention, besides its having a pear-shap'd fruit, that I am persuaded, as are many other persons skilled in these things, that Mr. Catesby never saw the blossom of this tree so as to determine absolutely the genus of it, or he would certainly have given it to us: and that he does not once say, that the inhabitants of Carolina call it the Poison tree, or even that it grows among them. I have (Fig. 3. Tab. 24.) given

(5) See Fig. 2. Tab. 24.

(6) See Fig. 3. Tab. 24.

you a sketch of a leaf, and some of the fruit, which I copied out of Catesby's Natural History, for your own observation, that you may compare it with the other figures, to save you the trouble of turning to the original.

How near Father D'Incarville, the jesuit of Pekin's Varnish-tree, which he says grows in the province of Nankin, will agree with the figure Kæmpfer has given us of his Fasi-no-ki, (7) or spurious Varnish tree, which Mr. Miller says in his letter are the same, I shall leave to those gentlemen who may have seen it growing in your curious exotic garden at Busbridge, or at the Physic Garden at Chelsea; at both which places it has been raised from seed received from the Royal Society, sent by Father D'Incarville a few years ago: but lest it may not be in the power of every curious person to take that trouble, I have sent you the figure of one of the leaves, which I drew from a specimen I got in your garden. As it has not been yet described, I shall call it (8) "*Rhus finensis foliis alatis, foliolis oblongis acuminatis, ad basin subrotundis & dentatis.*" You'll observe the lobes or small leaves are of an oblong figure, pointed at top and roundish at the bottom, where they are remarkably jagged with about four teeth. I have joined to the figure of this on the same paper an exact copy of a leaf of Kæmpfer's Fasi-no-ki (9), or spurious Varnish-tree, for your own remarks. Kæmpfer takes notice in his, that the middle nerve often divides the small leaves into two

(7) See Fig. 4. Tab. 25.

(8) See Fig. 5. Tab. 25.

(9) See Fig. 4. Tab. 25.

unequal parts, which is a character I have not observed in this China one; nor have I observed, that it is of a remarkable fine red in the autumn, as indeed many of the Sumachs are; whereas he gives us a very poetical description of the striking red of this wild Varnish at that season. Dr. Kämpfer, in the account he gives of his Sitz-dsju, or true Varnish-tree, takes notice of the effect of its poisonous exhalations: which brings fresh into my memory that this China Rhus, when first it began to extend its leaves in your small stove, had so remarkable a disagreeable smell, that I have frequently complained to you of getting the head-ach and a sickness at my stomach by remaining too long near it; and after you had it removed into your great stove, where, notwithstanding that building is very spacious, and near twenty feet high, yet, as it grew most luxuriantly, one could not without pain continue long near it. I measured one of the whole great leaves of this tree in the summer 1755, and it was above three feet in length. I suppose, as it is a native of Nankin, where the winters are cold, it thrives now well with you in the open air, as it does in the Physic Garden at Chelsea; where it throws out, like yours, a great number of suckers.

After Dr. Kämpfer has described the true Japan Varnish-tree, he then tells us, that the Varnish is collected from it near the city of Jassino, and that it is the best Varnish in the world; but that it is in so small quantities, that there would not be sufficient for their own manufacturies, were it not for a baser kind of Varnish, which is brought to them from Siam, and called Nam-Rak. This Siam Varnish he

tells us, is got in the province of Corfima and kingdom of Cambodia, from the tree *Anacardium*, called by the inhabitants *Ton-Rak*, that is, *Tree-Rak*. The fruit of this tree he says expressly is called in our shops *Anacardium*: his words are, "*cujus fructus officinis nostris Anacardium dictus (10).*"

In Mr. Mil'cr's answer to the Abbé Mazeas he says, this Varnish is produced from the *Anacardium*, or *Cashew nut-tree*: and recommends it to the inhabitants of our southern colonies in America to draw this Varnish from it, as a national advantage.

In order to know what kind of tree bears this officinal *Anacardium*, I consulted Linnæus's *Materia Medica*, and *Species Plantarum*; and there I find it a quite different genus of plants from the *Acajou* or *Cashew nut-tree* of *Tournefort*. He calls this oriental *Anacardium*, *Avicennia*; and has given its characters at large in his *Genera Plantarum*, and ranks it among the *Tetrandia monogynia*; whereas the occidental *Anacardium* or *Cashew nut-tree* of the American islands he calls *Anacardium*, and ranks it among the *Decandria monogynia*.

As the printers or stainers of callicoes in the East-Indies make use of some black dye, that holds its colour, and does not impair their cloths, I tried some fresh nuts of this oriental *Anacardium*, and found, that not only from my own experience, but lately from the confirmation of many gentlemen in the East-India trade, that a fine black colour, which will not wash out, is struck on cotton and linen with the

juice of the shell of this nut. They are known all over India by the name of Marking-nuts, and are sold for that purpose in their bazars or markets, the figure of which is annexed, N^o. 6. Tab. 25.

At the same time I tried the acrid oily substance of the shell of some fresh Cashew-nuts (11), and observed, that it gave no colour to linen, but remained like oil of olives on it.

I have heard indeed, that the juice of the fleshy fruit that supports the Cashew-nut will stain the lips black, and perhaps it may linen; but the gum or liquor which proceeds from the tree is agreed by later (12) authors to be of the same nature and mechanical use with gum arabic; and consequently will dissolve in water; which would render it improper for Varnish. The figure of the Cashew-nut and its fruit are annexed, N^o. 7. Tab. 25.

Dr. Kämpfer further observes, that the quantity of Varnish obtained from this officinal *Anacardium* tree is so great, as not only to serve to varnish all the utensils of China, Tonquin, and Japan, but that it is exported in wooden vessels to Batavia, and several other parts of India. It is not improbable therefore that this is the Varnish mentioned by Father D'Incarville in the Philosophical Transactions, Vol. 48. part I. p. 254, called Toeng-yeou; which is so universally used in China for preserving and ornamenting their furniture.

I must now confess to you frankly, that I cannot find, after carefully considering and examining Mr.

(11) See Fig. 7. Tab. 25.
Hist. of Jamaica, p. 225.

(12) See Brown's Nat.

Miller's letter, that he has brought any proof to lessen the merit of the Abbé Mazeas and the Abbé Sauvage's discoveries: and the use I would propose to you from the remarks I have made, is, that, as our Premium Society for the encouragement of Arts and Sciences have a scheme on foot to promote the growth of many really useful vegetable productions, which are at present brought to us, at a great expence, from Spain, France, Italy, the Levant, Africa, and the East-Indies; I think this *Anacardium orientale*, or *Avicennia* of Linnæus, claims a place among the rest; especially, when we consider of what use and importance it is in the two great empires of China and Japan, besides all the other parts of India. The chief difficulty will be the preserving its vegetative quality during two so long voyages; but by many contrivances I am persuaded it will at last be effected; however the very attempt is laudable.

Since I wrote the above I have received a specimen of the gum of the Cashew-nut tree, and find it dissolves in the mouth like gum arabic. It is of the colour of Myrrh; but very brittle, shining, and clear. I have also procured a specimen of the Varnish of China from Mr. Margas, a great dealer in China commodities, just as it was imported from thence: this seems to answer the description of the Siam Varnish. I have made some experiments on it, and find it does not dissolve by being put either into water or spirits of wine.

And further, Dr. Sibthorp, professor of botany at Oxford, informs me in a letter I received lately from him, that they have no specimen of the Sitz, or true Varnish-tree of Japan, in the Sherardian collection,

lection, as mentioned by Dr. Dillenius; but that they have one of the Fasi-no-ki, or spurious Varnish-tree of Kämpfer, with the synonym, "Toxicodendron foliis alatis fructu rhomboide, Hort. Eltham:" inscribed under, "from Japan:" and that it resembles much our American one. So that Mr. Miller's observations on his Toxicodendron, or Poison ash, may be proper in the sixth edition of his Dictionary, but not in his letter above-mentioned, where he makes the spurious Varnish-tree of Japan, or Fasi-no-ki, the same with the Nankin Varnish-tree, of which the Jesuits of China sent the seed over to the Royal Society a few years ago: whereas they are utterly unlike each other. Dr. Dillenius was perhaps led into this error by depending on the report made to Dr. Kämpfer on the common people of Japan; which was, that the true Varnish-tree degenerated into the spurious one for want of culture. But I believe our knowlege in this science is so much improved, that such doctrines are not easily admitted among our gardeners (whatever varieties may possibly arise from seed); and in this I am persuaded Mr. Miller will agree with me, that the two sorts of Varnish-trees, mentioned by Dr. Kämpfer, are two distinct species of Rhus, or Toxicodendron, and will ever remain so, let the soil be either good or bad that they are planted in. I am,

Dear Sir,

Your affectionate humble servant,

Lawrence Lane,
Nov. 8, 1756.

John Ellis,

P. S.

P. S. Since I wrote the above I received a parcel of the officinal Anacardiums, which had been lately brought from the East-Indies. These have their fleshy fruit with their stalks still adhering to them. The better to illustrate this matter, I have given a figure of one of them, Tab. 25. Fig. 8. The manner of the growth of this fruit evidently shews, that it cannot be the Oepata of the Hort. Malab, Vol. 4. p. 95. Tab. 45. as quoted by Dr. Linnæus; the whole nut of which is inclosed in a fleshy coat, like an almond. It seems to come nearest to the Cassubium Sylvestre of Rumphius, Hort. Amboin. Vol. 1. p. 179. Tab. 70.; where, besides the figure and manner of growth of the fruit, he mentions, that they varnish their warlike and other kinds of wooden instruments, of a black colour, with the milky juice which they draw from this tree; and that they mark themselves on their arms and other parts with the corroding juice of the nut, which continues a long time before it disappears.

Rumphius further particularly describes this plant to be of the Pentandria monogynia of Linnæus's method; so that it must differ intirely from the Anacardium Occidentale, which belongs to the Decandria monogynia of that author.

He likewise makes this remark, that the Cashew-tree, or occidental Anacardium, is not a native of the East-Indies; but has been brought thither by the Portuguese, from the Brasils: and that they are no-where to be found in those parts, but where they have had their settlements.

CXIII. *A Letter to George Lewis Scot, Esquire, concerning the present Increase of the People in Britain and Ireland: From William Brakenridge, D. D. Rector of St. Michael Bassishaw, London, and F. R. S.*

Dear Sir,

Read Dec. 9. 1756. **Y**OUR favourable acceptance of my two former letters, concerning the number of people in this city, and throughout England, has encouraged me to add this as a supplement to them; in which if the observations are not so agreeable as could be wished, they may perhaps be useful in our reasoning upon matters of Government, and help us to discover some things that may be wrong, or inconsistent with the public utility.

From the proportion of births and burials in England, and the number of people found, you have already seen what the annual increase might be; which appeared so small, that I was in some doubt whether there was any increase at all, after the deduction of our losses by our ordinary commerce at Sea, our wars, and emigrations to our Colonies. However, supposing, that there was an annual increase, I shewed the method of computing it, after any number of years; which sometimes may be of use in considering the increase of mankind in general. But now, having considered this subject farther, I think it may be proved, that there is no increase at

all from both our British Isles, after the deduction of our losses; and that in England, taken by itself, the natives would be in a decreasing state, if it were not for the supplies from Scotland and Ireland. As this seems to be of some importance to discover, because of its consequence with regard to Policy, and the influence it may sometimes have, I shall endeavour to shew it as plainly, as the present circumstances of things will allow.

Dr. Halley has shewn, from his Table of the Probabilities of life at Breslau, that the number of men able to carry arms in any country, between 18 and 56 years of age, or, as they are called, the fencible men, may be estimated as a fourth part of the whole people, children included. From which it demonstrably follows, that the fourth part of the annual increase will likewise be the increase of the fencible men; and that their increase or decrease will always be in that proportion. And therefore, if in England the annual increase of the people does not exceed 18000, as I have before proved from the proportion of births and burials, and the whole number being six millions, the annual increase of the fencible men will not be above 4500.

But in Scotland and Ireland this increase may be reasonably supposed to be more, in proportion as there are more marriages than in England. And therefore, to avoid any uncertainty in calculation, we will suppose the annual increase in those countries, to be double in proportion. That is, as we have from observation, assumed the births to be to the burials as 112 to 100 at an average through England, we will now allow them in Scotland and
Ireland

Ireland to be as 124 to 100 ; where the difference, which is the increase, is double to the other, and by which the whole people would be doubled in about 114 years ; which is surely as much as can be supposed. And then, by the method that has been shewn in my last letter, if the people in both countries do not exceed 2,500,000, the annual increase will be found to be 15,000, and the fencible men will be 3750.

From the account given in the Philosophical Transactions, N^o. 261, the number of people in Ireland, in the year 1696, did not appear to be more than 1,034,000 ; since which time there has been little increase, as I shall presently shew ; and in Scotland they are supposed to be less than 1,500,000 ; and so both together they cannot be reckoned at more than 2,500,000 : and therefore the annual increase of the fencible men cannot possibly be more than 3750, in both countries ; which with those in England will be 8250, for the annual increase in Britain and Ireland, or a little above 8000 men. And no reasonable computation can make them more.

It is true it may be said, that besides this increase, there is a considerable number of Foreigners, who come from all parts of Europe to settle among us, especially at London ; but it may be justly supposed, that they are nearly ballanced by the number that go from hence, to reside in other kingdoms, for the purposes of trade and other considerations. And there cannot be so great an accession of Foreigners, as is commonly imagined ; for they almost all come to this City, and yet it is not in an increasing state, as has been shewn in my first letter, notwithstanding

all its supplies from them, and from Scotland and Ireland.

The number then 8250 may be considered, at the utmost, as the yearly increase of the fencible men; from which all our public losses in our ordinary commerce at Sea, and in our wars by Land and Sea, and by our Colonies, are to be deducted. And it is plain, if in all these ways our losses are annually equal to about 8000 men, there can be no increase at all of our fencible men; and consequently no increase of our people, which must always be in proportion to them; but if our losses are more, we must be in a decreasing state.

To make a just and moderate estimate of our losses it will be proper, that we take fifty or sixty years at an average to avoid any uncertainty. And if we begin at the year 1690, which is 66 years ago, we shall find, that during that time, in our commerce at Sea, and in our wars by Land and Sea, we cannot have lost less than 450,000 men.

To shew this it may be observed, that in all bodies or armies of fencible men, which consist generally of those between 18 and 56 years of age, there dies annually about one in 54, by the natural decrease of life, as appears from Dr. Halley's Table. And therefore, if there are 80000 seamen or more, as is said in Britain and Ireland, the natural decrease, which is not here to be considered, will be about 1480 or 1500 annually. But the number must be much greater that is lost, by the various contingencies of the Sea, by wreck, scurvy, and the inclemency of different climates, &c.; for fewer cannot be supposed to be destroyed by such incidents, than the
double

double of those that may be by natural mortality. I think there must be more ; for if a ship goes a voyage for a year with an hundred men on board, and returns only with the loss of half a dozen, she is reckoned to have made a healthy voyage, though the loss is above three times what might be expected from natural decrease ; that is, though the loss by the Sea only may be considered as double the other. And it often happens, that by sickness there will be much more than this, besides all the other hazards of the Sea. Our ships of war in long cruising have generally a greater consumption of their people : So that our losses by Sea are rather undervalued, when they are estimated to be the double, of what is from the natural decrements of life. And, if this be allowed, the loss by the various contingencies of the Sea will be more than 3000 annually, over and above the number that might die by natural casualties if they were at home ; and in 66 years it must be 198,000..

And as to our losses by war at Land and Sea, of our own people, they are commonly reckoned to be 300,000, in all the three French wars, since 1690 : But if we abate 50,000 from that number, that we may reason with more certainty, they cannot possibly be less than 250,000 ; for in all those wars, that taken together were about twenty years, there must be more than 10,000 lost yearly by Land and Sea. And therefore, both by our commerce and wars, from that time mentioned, we have at least lost about 448,000, or 6800 annually. In which are included those who died by fatigue, and other hardships, as well as those in actual Engagements.

And

And if we add to this, the number that is constantly and secretly drawn from Ireland, for foreign military service and on the account of religion; and likewise those taken from Scotland, for our Regiments in the Dutch service; all which cannot be less than 500 yearly, though some have thought it to be double this, we shall then appear to have lost 7300 annually, since the year 1690. To which if we put the loss of those who go from hence to our Colonies, and other settlements, particularly to Jamaica and the East-Indies; and, last of all, the number we have lost by the use of spirituous liquors; it will be plain, that our whole loss cannot be less but more than 8250 annually; which is at most the yearly increase of our fencible men: And therefore that there has been no increase at all of our people these last 66 years; but rather perhaps a decrease, though it cannot be ascertained with any precision. And there is no avoiding this conclusion, unless it can be shewn, that the annual increment of our fencible men is much greater than 8250; which seems impossible, without proving the number of our people to be more than six millions, and the proportion of births to burials greater than any observations through England have lately made them.

And here it is to be observed, that if there has been no increase during that period of years, the people of England cannot be more than 5,500,000. Because, when they are computed from the number of houses at the year 1710, they do not exceed 5,467,000; and when in my last letter, I supposed there might be some increase, and gave a calculation of it to the present time, that, being added to the
above,

above, made only about six millions. And therefore the annual increase of fencible men in England is not above 4130, and in both Islands it does not exceed 7900; which being less than what we have allowed above, seems to corroborate what has been said.

Now if this can be proved, as I imagine it has, that there is no increase of our people in Britain and Ireland, because of our losses, we may make this unpleasant reflection, that our country can never be fully peopled, while our losses continue so great as they have been these last sixty years. For it has been shewn in my last letter, that we want one third more people, to be fully inhabited, and which we could conveniently maintain from our own natural produce, if our land was duly cultivated. And it may be farther observed, that as the greatest part of those losses above-mentioned belong to England, because of its much greater trade, and the greater number of its people, it may be considered as in a decreasing state with regard to its natives; and, if it were not supplied from Scotland and Ireland, the decrease would be plainly discovered. For, as the people in England are double to those in both the two other countries, its losses must be in that proportion at least, or about 5300 annually, two-thirds of the whole; which is more than the increase of its fencible men.

In London and Westminster the decrease has been observable from the Bills of Mortality within these last twelve years, as I have shewn in my first letter; but the greatest part of that may, I believe, be attributed to other causes, rather than national losses.

From

From the above calculation we may likewise see, how small the annual increase of fencible men may be in Britain, or perhaps in any other country in Europe. For as that increase in both our Islands does not appear to be more than 8250, but rather less, or about 7900, and the number of our whole people in them is not found to exceed 8,000,000, the annual increase in each million must be less than 1000, or about 987; that is, less than one in a thousand; though we have allowed the increase in Scotland and Ireland to be double in proportion to what it is in England. And from this we may form a good rule, by which we may judge of the increase, or decrease of other nations. For though they may be supposed to increase perhaps faster than we do, by more frequent marriages, the annual increase of their fencible men will not generally much exceed 1000, for every million of people. And therefore, according as their losses by war, or other devastations are fewer, or exceed 1000 fencible men annually, for every million of their people, they are either in an increasing or decreasing state; and for every 1000 men that are lost, there is the increase of a million for one year destroyed; which it were to be wished, that Princes would attend to, in their ambitious schemes, by which they make such havock of mankind.

And hence by the way we may observe, that France cannot be in an increasing state, unless their late encouragement for marriage has had some considerable effect; because if the number of her people, as Sir William Petty and others have reckoned, does not exceed 14,000,000, the annual increase of her
fencible

fencible men will not be much more than 14,000 : Which number seems to be exhausted during these last 66 years, in her frequent wars, her ordinary commerce at Sea, and emigrations to her Colonies. For all the annual increments put together, in that time, will not make above a million and the losses cannot be computed at much less. And this is some comfort to us in Britain, that our neighbours, who are rivals to us in trade and power, are not better economists of their people than we are ; and that their scheme of Government and superstition will never suffer them to increase, so much as they might reasonably do.

We may in general likewise observe, that in all Europe the annual increase of people must be much less than it was in some former ages. For the advancement of trade in the maritime countries, must greatly augment the loss of their fencible men. In Britain there is one-third of the increase of them destroyed by our concerns at Sea, and in Holland perhaps the whole of it ; and this added to the superstitious celibacy of other nations, must diminish much the increase of people.

The above method of shewing our want of increase, from the losses of our fencible men ; which are always in proportion to the whole body of the people, seems to me to be clear and demonstrative : But the same thing may likewise be conjectured, from the exportation of our corn. For there is as much now sent abroad as was forty years ago, or perhaps more ; besides a great deal of it distilled, which was not formerly done. And if there is the same quantity exported, there must be nearly the same con-

sumption at home, and consequently about the same number of people, unless there is a much greater quantity of land improved. But it seems evident, that if we were in an increasing state, our late improvements of land could not cause such a surplus, over our home-consumption. For there is near about a fifth part, of our whole crop of wheat exported annually. A quantity that shews we want people to consume our natural produce, and that our country is but thinly peopled.

Now, to account for the cause of the want of increase in our British Isles, it seems to be chiefly owing to three things, that operate together. The fashionable humour that greatly prevails, by which above one-third of our people in England above twenty-one years of age are single, occasioned by a variety of circumstances; and to our wars and commerce at Sea, which are rather beyond our natural strength, by destroying more of our people than can well be spared, and which, if preserved, might improve our country, and augment our power; and lastly, to the use of spirituous liquors, by which numbers have been and are daily lost. But there may be easy remedies for two of those evils, by a little attention of the Legislature; which would greatly conduce to the public happiness.

And thus, Sir, I have wrote this third Letter to you, upon a very uncommon subject: but I hope the importance of it will plead my excuse. And if I have discovered any thing that has not been known, and that may be useful in our speculations upon Government, I shall think my time and pains have

not been misapplied; but if I have been mistaken, your usual goodness will, I trust, forgive

Your most affectionate

Sion College,
Nov. 25, 1756.

and faithful servant,

Wm. Brakeuridge.

P. S. Since the above was written, I have been certainly informed, that from the survey lately made of the window lights, after the year 1750, there are about 690,000 houses charged to that Tax in England and Wales, besides cottages that pay nothing. And though the number of cottages is not accurately known, it appears from the accounts given in, that they cannot amount to above 200,000. And therefore there are not in England and Wales more than 890,000 houses, or 5,340,000 people, allowing six to a house; which well agrees with what I have said in this and my former letter, and corroborates the whole of my reasoning. For if the survey made before the year 1710 was near the truth, from which it appeared, that there was not above 729,048 houses, besides cottages, or 929,048 houses in the whole; which will make about 5,570,000 people; then there must have been no increment since that time, but rather a decrease, notwithstanding the continual supplies from Scotland and Ireland, and from Foreigners.

I beg leave likewise to mention, that I find some people have objected to the Bills of Mortality,

talities, from which I computed our numbers in London and Westminster, in my first Letter; That they are too uncertain to found any calculations upon; that sometimes in the weekly Bills there are omissions of some of the largest Parishes, and perhaps in the yearly Bills. To which it is answered. If there are omissions sometimes in the weekly Bills, these are afterwards supplied in the subsequent weeks, and at the end of the year the whole account to each parish is made up, as accurately as the circumstances will allow; so that upon the whole it is presumed, the yearly Bills are done in such manner, that they may be depended upon; for otherwise they would be a vile imposition upon the Publick. And if they are properly taken care of, they may be considered as the index of the health and numbers of the people, as they are in other cities in Europe; in which view they have always had some credit, for a century past, and been attended to as of some importance; and many ingenious men have deduced useful speculations from them. But if it should be allowed, that there are inaccuracies in them, it cannot reasonably be supposed, that there are more now than ever have been; for there is as much care taken of them lately as ever.

The argument then from which I inferred, that there is a decrease of the inhabitants within the Bills is this; That, before the year 1743, for twenty years, the burials in them were at an average above 27,000, and the baptisms between 15,000 and 17,000; but since that time they are both gradually decreased; so that now the
burials

burials are about 22,000, and the baptisms between 14,000 and 15,000, taken at an average for ten years: And therefore these different numbers, continued so long, cannot come from the same number of people; but that as the burials and baptisms are both decreased, the whole people must be also diminished. This seems to be fair reasoning, if the Bills are true. The times were as healthy before the year 1743, as ever since; there were as many burials carried out into the country before that time as afterwards; and there were as many Dissenters to lessen the number of burials and baptisms before that time as ever after. What then is to be concluded, the circumstances being the same, but that there must be a diminution of the people? And this may be imperceptibly made; either by the increase of celibacy, or by fewer coming annually to reside in Town than formerly, and more retiring from it; which last case I consider rather as an advantage to the kingdom, as it may tend to the improvement of the country.

It is true, we do not see so great an increase of empty houses, that may answer to the decrease in the Bills; but it may be easily imagined, that some hundreds of families may be diminished, and not one house left empty. The one half of our people consist of Lodgers, Inmates, and Children; and therefore there may be a great decrease of these, and yet not many more houses empty: Though it is also to be considered, that there are much fewer houses now within the Liberties of the city, than were before 1743; many being built in place of two or three, or more, and ware-houses

houses made of others. I know some Parishes, in which they have lost one tenth of their number, by this means, since that time; so that within the walls I find there is above double the number lost, that I mentioned in my Letter. To live in large houses is now a part of our luxury. But if there be an increase of houses in Paddington, Mary le bone, &c. without the Bills of Mortality, this does not affect my argument; which was only to shew, that there was a decrease of the people within them; and surely such a small increment is not to be compared to the probable decrease on the whole.

In that first Letter I reasoned, and made my calculation, upon the same principles with Sir William Petty, Mr. Graunt, and other approved Authors. From a continued increase in the Bills they inferred, that there must be a proportional increase of inhabitants; and I from the continued decrease in them, in the same circumstances, have endeavoured to prove a similar decrease of people. If their reasoning is just, mine cannot be false; and if the Bills never again appear so high, as formerly for a continuance, in healthy times, it will be a demonstration:

CXIV. *A Letter to the Reverend William Brakenridge, D. D. Rector of St. Mich. Bassishaw, and F. R. S. with a Table of the Value of Annuities on Lives, by Mr. James Dodson, Master of the Royal Mathematical School in Christ's-Hospital, and F. R. S.*

Reverend Sir,

Read Dec. 16.
1756.

AS I have made a great many calculations, relative to Annuities on Lives, and have otherwise contributed, as much as was in my Power, to facilitate the performance of such, I thought it, almost, a duty incumbent on me, to compute the values of them according to your curious Table of the Decrement of Life, inserted in the Philosophical Transactions; accordingly I have inclosed a table of them, and if you find it will bear examination I desire you to communicate it to the Royal Society, in order (if approved of) to its being inserted, as an appendix to your letter to the President. I am,

Reverend Sir,

Your most obedient and
most humble Servant,

Christ's-Hospital,
Dec. 8, 1756.

James Dodson.

A Table

1 Table of the Value of an Annuity of One Pound, payable yearly, during a Life of any Age, allowing compound Interest at 4l. per Cent. per Ann. computed from the Table of the Decrements of Life, constructed by the Reverend William Brakenridge, D. D. F. R. S. inserted Page 181.

1	12,510	23	15,865	45	11,800	67	6,338
2	15,001	24	15,688	46	11,580	68	6,007
3	16,001	25	15,504	47	11,360	69	5,670
4	16,781	26	15,313	48	11,190	70	5,399
5	17,470	27	15,112	49	10,960	71	5,139
6	17,712	28	14,951	50	10,780	72	4,895
7	17,800	29	14,784	51	10,540	73	4,677
8	17,821	30	14,612	52	10,350	74	4,395
9	17,800	31	14,433	53	10,170	75	4,130
10	17,781	32	14,280	54	9,938	76	3,895
11	17,671	33	14,090	55	9,694	77	3,708
12	17,560	34	13,890	56	9,444	78	3,603
13	17,453	35	13,740	57	9,186	79	3,468
14	17,291	36	13,580	58	8,918	80	3,261
15	17,171	37	13,420	59	8,643	81	3,146
16	17,000	38	13,210	60	8,361	82	2,923
17	16,855	39	12,960	61	8,071	83	2,508
18	16,716	40	12,780	62	7,839	84	2,084
19	16,525	41	12,590	63	7,541	85	1,651
20	16,379	42	12,400	64	7,234	86	1,210
21	16,221	43	12,190	65	6,920	87	0,762
22	16,061	44	11,980	66	6,598	88	0,320

CXV. *An Account of an Earthquake felt at Colen, Leige, Maestricht, &c. on the 19th of November, 1756: In a Letter from Mr. Abraham Trembley, F. R. S. to Thomas Birch, D. D. Secretary to the Royal Society. Translated from the French.*

S I R,

Hague, Nov. 26, 1756.

Read Dec. 16. 1756. **T**HERE 'was felt' on the 19th of this month, at three in the morning, a shock of an earthquake, at Colen, Leige, Maestricht, in the country of Limburg, and, as appears, in all that between the Meuse and the Rhine.

This shock continued but a short time; and there is no account at present of any damage done by it.

One of almost the same kind was felt in the same places on the 3d. of June.

You saw by the account, which I sent you on the 11th of May, that earthquakes were very frequent in this country in the beginning of this year. The shock, which has been lately felt in these parts, as well as in Portugal, shews, that the cause of earthquakes is still active.

I have not yet procured the sequel of the observations made in Valais on that subject.

I know, that persons very attentive observed, that in the neighbourhood of Lisbon for several days after the 1st of November 1755, those, who lay upon the

ground, perceived a motion under them, which they compared to the beating of the pulse. They mention likewise, that after this motion ceased to be felt, there was perceived another, which they compare to that felt in a boat on a river, the current of which is very flow. Those only, who lay on the ground, were sensible of this motion; for such, as were sitting on chairs, or standing, perceived nothing of it.

This is the whole, Sir, of what I have learned on this subject. I leave you to judge, whether it be worth communicating to the Royal Society; whom I request you to assure of my most profound respect, and of my desire to merit the honour done me of admitting me into their body.

I am with the greatest regard,

Sir,

Your most humble

and most obedient servant,

A. Trembley.

CXVI. *An Account of a Treatise, in Latin, presented and dedicated to the Royal Society, intituled, "Gottlob Caroli Springsfeld, "M. D. &c. &c. commentatio de prerogativa Thermarum Carolinarum in dissolvendo calculo vesicæ præ aqua cal-cis vivæ," by William Watson, Member of the Royal Academy of Physicians at Madrid, and F. R. S.*

Read Dec. 23, 1756. **D**R. Springsfeld's Treatise, which he lately communicated to the Royal Society, contains a series of experiments and observations upon the Carlsbad waters in Bohemia, as a solvent for the stone in the bladder; from whence it appears, that these waters have that property in a much higher degree than even lime-water. The Carlsbad waters have been long celebrated for their excellent effects in removing, or at least relieving, many of the disorders to which mankind is subject. How high they stood in the opinion of the great Hoffman almost every part of his writings bears testimony; and if to their other before-known properties they should prove a safe, easy, and effectual solvent for the stone in the kidneys and bladder, it certainly would greatly enhance their value.

Our author has very attentively considered the writings of Doctors Jurin, Hales, Hartley, Whytt, and others, concerning solvents for the stone. He has administered to several patients, with little or no

success, the late Mrs. Stephens's medicine, with the strictest observance of all the cautions, said to be necessary in courses of that medicine. And, though he allows every thing to be true that has been laid down by Dr. Whytt and others in relation to oyster-shell lime-water, he does not scruple to assert, that the Carlsbad waters, which, as will hereafter appear, have great analogy to calcarious waters, are a far more excellent solvent for the stone in the kidneys and bladder than any lime-water. Of this truth he is satisfied by various experiments, several of which were made by himself alone, and others in conjunction with our learned and ingenious brother Dr. Lieberkuhn, whose exactness as well as fidelity in making experiments of this kind no one will question.

Dr. Springsfeld, in a treatise upon the Carlsbad waters, published by him in the year 1749, has shewn by undoubted experiments, that these waters partake always of an alkaline principle; for every pint of them, besides the neutral purging salt, contains three grains of alkaline salt, and ten grains of calcarious earth; for which reason they ferment with every species of acids. I before mentioned, that these waters have great analogy with lime-water; and if they continue in the baths for any considerable time, they not only turn milky, like lime-water, but have a pellicle upon them as that water is observed to have. They have likewise a gently constringing taste; that was it not for their saline taste they could not easily be distinguished from lime-water.

It must here be premised, that all hard bodies, viz. pieces of wood, bone, stones, earthen vessels, bits of straw, and such-like, are incruited over by
lying

lying in the Carlsbad waters, and that in a very little time. These bodies in the space of a night will be covered with a tophaceous crust, which continually increases. But human calculi, though hard in themselves, are not incrusted thereby ; but are rather dissolved ; which is the more remarkable. The same effects are observed upon pieces of the hardest cheese, which swell in these waters, and are changed into a kind of pultice.

In the treatise before us our author has given the detail of many experiments, which prove the solvent power of these waters. I shall lay a few of them only before you, from which an opinion both of our author's exactness in making them, as well as how far he is justified in his conclusions, may be formed. And here I must observe, which should be a very comfortable consideration for the inhabitants in these parts, that our author has been obliged frequently to suspend his researches for want of human calculi, which is a disease exceedingly rare in Bohemia.

June 20, 1749. A stone of a brown colour, which weighed near two ounces and half, was placed in a china basin near that source, which is called Brudel, in such a manner as to be continually covered with the warm water. Upon the next day the external crust began to grow soft ; upon the third, you might make an impression thereupon with your nail as upon cheese ; upon the fourth and fifth, it was dissolved to the nucleus ; upon the sixth, the nucleus itself was dissolved, and in the bottom of the basin there was left a white viscid mass, like pultice, or newly steeped cheese : this was impalpable between the
the

the fingers. In this time the bafon was incrufted with a very hard tophaceous mafs, of the thicknefs of a quill. Certain calculi, not bigger than peafe, were diffolved thoroughly, fome in one day and the reft in two.

1750. June 12. A ftone, weighing more than half an ounce, was placed in the fame manner as the former, and not a grain of it remained on the fourth day. At this time a clergyman, who was in a courfe of thefe waters for gouty complaints, voided fix ftones, which all were diffolved in the fame manner.

A nobleman, who was afflicted with bloody urine, from calculi in the kidneys, came to Carlsbad for the relief of his complaints; and brought with him fome fmall calculi, which he had voided a few years before. By Dr. Lieberkuhn's advice Dr. Springsfeld divided thefe calculi into four equal parts, each of which weighed fix grains. One part of thefe was infufed in the water of the fource called Brudel; the fecond, in the New Spring; the third, in that near the mill. In twelve hours the firft part had loft five grains; the fecond, four; and the third, only one grain. The fourth portion was put upon a linen rag, which was ftretched over the bottom of a funnel. Into this funnel the nobleman was directed to make water every day before dinner, after his having drank his quantity of Carlsbad water. Upon this, thefe calculi, after eight days, had loft two-thirds of their weight; viz. four grains. It muft be here remarked, that this nobleman, during the regimen, did void feveral fmall calculi, which he had not done for fome years. A larger quantity of bloody urine than ufual attended the parting with thefe ftones; but

but this continued only two or three days, and afterwards went quite off; and this nobleman from that time was relieved from his former complaints, has enjoyed and does yet enjoy the most perfect health.

In the year 1754, our author became possessed of a calculus, which was of a flinty hardness, and bore a bright polish. It weighed a quarter of an ounce. He conjectured, that a much longer time would be necessary to dissolve this stone; but what was very remarkable it dissolved sooner than the rest: for after having been immersed twenty-four hours, two grains of it only remained undissolved. This stone was not placed in the china basin as the others were, but suspended in a little loose-woven net, that it might more freely be washed by the water. Dr. Lieberkuhn was at this time at Carlsbad; he was present at this experiment, and was witness of its truth. The net used in this experiment was covered with a tophaceous crust, from being steeped in the water.

The next year, when Dr. Lieberkuhn returned to Carlsbad, he brought with him, for experiment-sake, several calculi, some of which were large ones. He made there many experiments, in which our author assisted. A large stone was sawed into four pieces nearly equal. One of these, weighing 99 grains, was put into a little linen bag, and immersed in the source called Brudel: the second, in like manner, which weighed 96 grains, into that called the New Spring: the third, weighing 93 grains, into that near the mill: the fourth was set apart for other trials. After four days immersion they were severally examined. The first had lost 85 grains; the second, thirty-

thirty-three grains; the third, only 16 grains. That it might be estimated in what degree the solvent power of the Carlsbad water did exceed that of lime-water, the following experiment was tried. Three pieces of calculi, each exactly thirty grains in weight, were put into separate phials. Upon one was poured some fresh egg-shell lime-water: upon the second, some Carlsbad water: upon the third, some of the urine of a person daily drinking these waters for the recovery of his health. These phials were all placed in one of the canals, which carries off the waste water from the baths: the degree of heat in this place was by Fahrenheit's thermometer 96, much the same as the heat of human blood. The lime-water, the Carlsbad water, and the urine, were changed every day, and the process continued for fourteen days. Upon the fifteenth, the remaining fragments of stone were taken out of the phials, and weighed when dried. The piece macerated in lime-water had lost one grain: that in the Carlsbad water, six grains: that in the urine, five grains. According therefore to this experiment the solvent power of the Carlsbad water was six times, that of the urine five times greater than that of the lime-water.

The solvent power of medicated urine is of very great importance, and requires more particular attention; as our greatest expectations in dissolving the stone in the bladder must arise from that. It was therefore very fit that our author should investigate, as far as was in his power, the solvent property of the urine of those who drank these waters. He therefore suspended to the end of a funnel a sufficiently hard and compact calculus, weighing about an ounce.

This

This was contained in a linen rag, so that the urine might readily pass over it; and a person, who used the Carlsbad waters every morning, after having taken them, constantly made water into that funnel; from whence it came to pass, that on the sixteenth day the stone was half dissolved, and the remaining part was become so porous and friable, that it almost fell to pieces. No one can suppose that the urine of a man perfectly in health would have the same solvent property; lest however that should happen, our author suspended a piece of a calculus, weighing two drams, in the same manner with the preceding, and made water upon it himself many times a day: but this piece of calculus, after twelve days, was so far from being lessened, that it had increased two grains in weight.

Our author, lest he should be thought to have depended too much upon one set of experiments, made others. Among several calculi, which Dr. Lieberkuhn had communicated to him, there was one exceedingly hard. This he cut into four parts, each weighing exactly eighty grains. Each of these was put into a separate phial. Upon the first was poured fresh oyster-shell lime-water: upon the second, Carlsbad water: upon the third, the urine of one who drank these waters: upon the fourth, the urine of one perfectly in health, and who only drank for his breakfast some cups of tea. These phials were placed in the same manner with those before-mentioned, and their heat kept constantly the same. Every day these calculi had fresh liquid poured upon them after the old was separated. At the end of twenty days these stones were dried and weighed. The fragment in-

infused in oyster-shell lime-water was found to have lost almost three grains: that in Carlsbad water twenty-two grains: that in medicated urine fourteen grains: but that infused in the urine of the man in health had increased three grains. These experiments therefore leave no room to doubt of, either the solvent power of the Carlsbad water itself, or that of the urine of those who drink these waters.

Our author has a very curious remark in relation to a person who laboured under the stone, and who drank these waters for two months. He daily voided with his urine a large quantity of white viscid mucus; which, after filtration of the aqueous parts from it, was found to be a white earthy powder, rubbed off as it were from a stone. The quantity of this powder saved during the space of a month amounted to more than three ounces. If some of this powder was put into the urine of one who drank Carlsbad water, it was immediately converted into a pulaceous substance; but if into that of one, who did not drink this water, it fell quite undissolved to the bottom of the vessel.

Dr. Springsfeld observes, that the Carlsbad water has great power in dissolving the tophaceous crust, which frequently covers the teeth. During the course of these waters, this crust most generally separates from the teeth, and falls off,

However great the power of these waters are in dissolving the stone in the bladder, they have a quite contrary effect upon gall stones. So far from dissolving these last, our author has frequently found, that these waters envelope them with their tophaceous crust. Our ingenious brother Dr. Whytt has observed,

observed, that lime-water has no solvent power upon gall stones. Hence we draw another proof of the analogy of lime-water with Carlsbad water.

If it should be wondered at, how it comes to pass that the urine of those who drink these waters should have the power of dissolving the stone, it is necessary to inform our readers, that this urine contains nearly the same properties which the water originally had. It has before been observed, that these waters are impregnated with an alkaline principle, and consequently ferment with acids. The urine of those who drink them, if made before dinner, has the very same quality as our author has frequently experienced; especially if the accustomed quantity of water is taken, and nothing else is drank upon them. The customary dose at Carlsbad is not less than six, seven, or eight pints of water taken every morning: for which reason we are not to wonder that the urine has the property of dissolving the stone in the kidneys and bladder, if it is long retained. And our author makes no scruple, but that the injection of these waters into the bladder would be very powerful in relieving calculous complaints; though this he had never tried; neither was he much induced there-to, as the urine is possessed of all the powers which he was in search of.

It remains that we just take notice, by what means these waters are possessed of their solvent power. It is well known, that acids, more especially mineral ones, do dissolve animal calculi, by acting upon their terrestrial parts, dividing their masses, and becoming neutral thereby. These effects do not arise from alkalies, as they leave terrestrial substances untouched.

If sometimes we carefully attend to the operations of nature, we now and then make discoveries which must otherwise have escaped us. If we pour nitrous or vitriolic acid upon that stoney substance, which is usually called crabs-eyes, and let them remain in the glass for a considerable time perfectly still, we shall find at the bottom of the vessel, after the terrestrial parts are thoroughly dissolved, a membranous substance or jelly, exactly in size and figure resembling the crabs eyes, and which the acid had left untouched. Exactly such a gelatinous mass our author has observed in stones of the bladder, more particularly in small ones, after dissolving them in acids. If crabs-eyes are infused in an alkaline lixivium for a considerable time, we see no change in them, which can be properly called a solution: about them we observe a certain viscid appearance like a cloud; if that is taken away, and the crabs-eyes are dried, and afterwards weighed, they have not only lost part of their weight, but are become much more friable; which is a great argument that they have lost something. If afterwards these crabs-eyes are washed with warm water, to carry off the alkaline matter adhering to them, and afterwards set to dissolve in acids, these crabs-eyes, after the solution of their terrestrial parts, leave nothing gelatinous behind them, as they did in the other experiment; from whence it is plain, that the gelatinous substance had been extracted and dissolved by the alkaline lixivium. The very same thing happens to the human calculus.

It appears therefore more than probable to our author, that lime-water and Carlsbad waters, on account of their alike partaking of the alkaline and calcarious principle,

principle, do dissolve the before-mentioned animal gluten only, by which the terrestrial parts are united together ; and upon the solution of which these parts must separate and fall asunder. From hence may be accounted for also the origin of that white viscid matter, which adheres to the bottom of the vessel like pultice, after the dissolution of calculi in the Carlsbad waters ; and which is nothing more than the terrestrial parts of the stone deprived of the animal gluten, which makes them adhere together. Hence we see the reason why our predecessors adopted two sorts of lithontriptic remedies, and those of quite opposite properties. Basil Valentine, Paracelsus, Helmont, and others, administered alcalies : Sylvius, Laurembergius, and Dippelius, acids. By these last they attempted to dissolve the terrestrial parts ; by the former, the connecting gluten. But the case in gall stones is different : their connecting gluten, which unites the bilious parts, is not an animal jelly, as in the *calculus vesicæ*, but a fat inflammable oil, which is neither dissoluble by the Carlsbad waters nor by lime-water.

Our author conjectures that he has proved demonstratively, that the solvent power of the Carlsbad waters does exceed that of lime-water ; besides which it has this advantage, that it is not in the least nauseous, and may be continued, if necessary, for six or eight months, without any other inconvenience than that of drinking them upon the spot ; which may indeed oblige persons whose dwellings are remote from Carlsbad to take a journey thither ; whereas lime-water may be drank at home.

I have been the more copious in my account of the work before us, as the subject of it is very interesting; one, in which some of our brethren have remarkably distinguished themselves, which occasioned Dr. Springsfeld to dedicate his performance to this learned Society. The experiments in his work, of which there are many, are well devised, and to appearance carefully executed. He has not attempted to amuse us with vain and fruitless speculations; but, on the contrary, has nobly turned his thoughts towards obviating the distresses, and relieving the miseries, to which human life is unhappily subject.

W. Watson.

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- Pag. 77. Not. 2. for *Neuburg*, read *Neubrig*.
 202. Not. 1. for lxx read lxxv.
 204. Not. 1. for *Monum*, read *Monm*.
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 468. Line last, for XLIV. read LXIV.
 485. Line 3, for *Cupping*, read *Tapping*.
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